

# NULATO RIVER SALMON ESCAPEMENT PROJECT, 1997



by  
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## TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES.....	iv
LIST OF FIGURES .....	v
LIST OF APPENDICES.....	vi
ABSTRACT.....	vii
INTRODUCTION .....	1
Fishery Description.....	2
Nulato River Escapement Assessment.....	2
Study Area .....	3
Objectives .....	3
METHODS .....	3
Site Selection and Preparation.....	3
Escapement Estimation Sampling .....	4
Age-Sex-Size Sampling .....	4
Hydrological and Climatological Sampling.....	5
RESULTS AND DISCUSSION.....	5
Escapement Estimation .....	5
Chinook Salmon .....	6
Summer Chum Salmon.....	6
Age-Sex-Size.....	7
Hydrology and Climate .....	8
LITERATURE CITED .....	9
TABLES .....	10
FIGURES.....	17
APPENDICES .....	24

## LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Nulato River tower daily expanded counts for chinook and summer chum salmon by bank and daily total, 1997 .....	10
2. Nulato River tower daily and cumulative counts and proportions for chinook and summer chum salmon, 1997 .....	11
3. Season total counts and proportions by hour for Nulato River chinook and summer chum salmon, 1997 .....	12
4. Nulato River summer chum salmon weighted age and sex composition and mean length, 1997.....	13
5. Nulato River tower project climatological and hydrological observations, 1997 .....	14
6. Historic daily and cumulative Nulato River chinook salmon escapement, 1994-1997.....	15
7. Historic daily and cumulative Nulato River summer chum salmon escapement, 1994-1997 .....	16

## LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Alaskan portion of the Yukon River showing villages and fishing district boundaries ....	17
2. The Nulato River drainage showing the counting tower site in 1997.....	18
3. Nulato River chinook and summer chum salmon daily counts by bank, 1997.....	19
4. Nulato River chinook and summer chum salmon cumulative counts, 1994-1997 .....	20
5. Season total counts by hour for Nulato River chinook and summer chum salmon, 1997.....	21
6. Nulato River age and sex composition by stratum, and sex composition by age group, 1997 .....	22
7. Nulato River tower project climatological and hydrological observations, 1997 .....	23

## LIST OF APPENDICES

	<u>Page</u>
APPENDIX A: HOURLY COUNT BY DAY	
A.1. South Bank Nulato River expanded chinook salmon tower counts by hour and date, 1997.....	24
A.2. North Bank Nulato River expanded chinook salmon tower counts by hour and date, 1997.....	25
A.3. North and South Bank Nulato River combined expanded chinook salmon tower counts by hour and date, 1997 .....	26
A.4. South Bank Nulato River expanded summer chum salmon tower counts by hour and date, 1997 .....	27
A.5. North Bank Nulato River expanded summer chum salmon tower counts by hour and date, 1997 .....	28
A.6. North and South Bank Nulato River combined expanded summer chum salmon tower counts by hour and date, 1997 .....	29
APPENDIX B: AGE COMPOSITION BY STRATUM	
B.1. Nulato River summer chum salmon age and sex composition by stratum and weighted season total, 1997.....	30
APPENDIX C: NULATO RIVER FIELD FORMS	
C.1. Nulato River field purchase record form.....	31
C.2. Nulato River hourly tower count data log form .....	32
C.3. Nulato River project hourly salmon counts.....	33
C.4. Nulato River radio reporting form.....	34
C.5. Nulato River beach seine catch record form .....	35
C.6. Nulato River climatological and hydrological observation form .....	36



## ABSTRACT

In 1997, the Nulato Tribal Council and Alaska Department of Fish and Game estimated the daily passage of summer chum salmon *Oncorhynchus keta* and chinook salmon *O. tshawytscha* from towers using visual observations during the period June 20 to July 21. Counting was interrupted at 2300 on July 12 until 0700 on July 13 due to high and turbid water. Counts were interpolated for the missed period. Total estimated escapement during project operations was 158,171 summer chum salmon and 4,766 chinook salmon. Observations of commercial harvests, aerial survey data and other escapement projects indicate that chinook salmon runs to the lower Yukon River were generally strong and escapement goals were achieved in all but one surveyed system in the area below the Tanana River. However, escapement estimates of chinook salmon are less comparable between years because chinook salmon migrate in the deeper water where visibility varies from year. Summer chum salmon escapements were average or above average in the Anvik, Nulato, Chena and Salcha Rivers, and in Kaltag Creek and Clear Creek. However, escapements of summer chum salmon into the East Fork Andreafsky, Gisasa and South Fork Koyukuk Rivers were below average.



## INTRODUCTION

The Yukon River drainage supports major stocks of chinook salmon *Oncorhynchus tshawytscha*, summer and fall run chum salmon *O. keta*, and coho salmon *O. kisutch*. These species contribute to commercial and subsistence fisheries throughout the Yukon River drainage. Pink salmon *O. gorbuscha* and Sockeye salmon *O. nerka* are also indigenous to the Yukon River. Pink salmon return to lower drainage tributaries and typically have stronger runs in even numbered years. Sockeye salmon are documented less frequently. Neither pink nor sockeye salmon are harvested commercially or for subsistence to any extent. Summer chum salmon are distinguished from fall chum salmon by their earlier entry timing (early June to mid-July) into the Yukon River, their smaller size, and spawning distributions into lower and middle Yukon River drainages. Fall chum salmon enter the Yukon River from mid-July to the first of September and spawn primarily in middle to upper portions of the Yukon River drainage. Management of each species requires reliable run strength and run timing information from harvests and escapements as they move up the Yukon River. Pilot Station Sonar, test fishing indices, age and sex composition information, and commercial and subsistence harvests provides run strength and run timing information but these assessments do not provide escapement information. In the past, there were relatively few projects that provided spawning escapement information on various stocks. Historically, most information on escapements came from aerial surveys. While this information is used to make relative comparisons of an index of escapement between years, it does not provide total spawning escapement information. Experience of surveyors and pilots, timing, and survey conditions such as weather and water clarity, make the quality of aerial survey indices unreliable to use as an escapement count. Counting towers, weirs, sonar projects and mark-recapture projects provide total population estimates. These projects are far more accurate than aerial survey counts. Escapement projects are typically operated on tributaries that are easily accessible and/or are considered to be an important spawning tributary. In recent years, increased involvement and participation by federal agencies and private organizations have increased spawning escapement projects in tributaries such as the Nulato River. These escapement projects provide researchers and managers quality escapement information and age, sex and size information that can be used for management of Yukon River salmon resources.

Prior to 1994, lower river test fishing catch rates, inseason passage estimates from Pilot Station Sonar at kilometer (rkm) 198 and the Anvik River sonar project provided most of the available information used to make management decisions concerning the commercial harvest of summer chum salmon in District 4 (Figure 1). The Anvik River is located at river rkm 512 and is the largest producer of summer chum salmon in the Yukon River drainage. There was a need for an inseason escapement monitoring project for summer chum salmon within the upper portion of District 4 that could serve as an index for the size and quality of spawning escapements in that portion of District 4. The Nulato River, because of its location near a community and historical magnitude of aerial spawning escapement indices, was chosen as a counting tower site. Beginning in 1994, a cooperative counting tower project was initiated by the Tanana Chiefs Council, Nulato Tribal Council and Alaska Department of Fish and Game to count salmon migrating into the Nulato River. The Nulato River is believed to be the largest producer of summer chum salmon upriver of the Anvik River (Sandone 1995). Spawning chinook salmon also utilize the Nulato River. Some pink and coho salmon have been reported to spawn in the Nulato River but not in significant numbers.

A thorough review of the Nulato River and probable contribution of salmon production from this stream to the Yukon River is presented in the report *Nulato River Salmon Escapement Project, 1994* (Sandone 1995), which was the first year of operation. The 1995 field project data was reported only as a brief summary by Paul Headlee, Water Resource Specialist, TCC (Headlee 1996). Paulus (1997) reported results from the 1996 season. This report presents information gathered during the 1997 field season.

### *Fishery Description*

Many chum salmon stocks contribute to subsistence and commercial harvests. Salmon returning to the Nulato River are most likely harvested in commercial and subsistence fisheries throughout the mainstem Yukon River from the coast of the delta to the mouth of the Nulato River. These areas include Districts 1, 2, and 3 and most of District 4 (Figure 1). The 1997 preseason outlook for the Yukon River was for a near average chinook salmon run and a below average to average summer chum salmon run. The commercial harvest in the Alaskan portion of the drainage was anticipated to be between 88,000 and 108,000 chinook and 200,000 to 600,000 summer chum salmon.

Summer chum salmon abundance was below average in 1997. Harvest of salmon returning to the Nulato River was most likely influenced by a number of factors in 1997. Declining salmon markets for chum salmon flesh and roe also had major impacts on the summer chum salmon commercial fishery. These factors resulted in a reduction of fishing and buying effort, which limited summer chum harvests in most districts and lowered the exvessel value. With regards to fish sold in the round, the overall Alaskan Yukon River chinook salmon commercial harvest was 5% above the 1992-96 average and the summer chum salmon commercial harvest was 48% below the average. Chinook salmon roe sales were 12% above the 1992-96 average and summer chum salmon roe sales were 51% below the average. The number of permit holders participating in the fishery during 1997 was below the recent five-year-average and the lowest on record since 1972 (ADF&G 1998). Yukon River fishermen in Alaska received an estimated \$5.9 million for their catch in 1997, approximately 12% below the recent 5-year average of \$6.7 million.

### *Nulato River Escapement Assessment*

The Nulato River is one of the department's primary aerial survey index areas for assessing the relative magnitude of summer chum and chinook salmon spawning escapements within the Yukon River. Summer chum salmon escapement goals for the Nulato River were first established in 1981. In 1997, the summer chum salmon aerial survey goal for the North Fork was set at 53,000 fish (Sandone 1995). Although aerial survey data are lacking or of poor quality for some years, in years when aerial surveys were conducted, the escapement objective has not been observed except in 1986.

Chinook salmon escapement goals have also been established for the Nulato River (Sandone 1995). Most recently, chinook salmon escapement goals for Yukon River stocks were re-evaluated in the spring of 1991 and made effective for the 1992 season (Buklis 1993). Minimum interim escapement goals for chinook salmon were established, based on aerial survey counts, for both forks of the

Nulato River as part of that effort. In 1997, minimum aerial escapement goals were 800 chinook salmon for the North Fork and 500 chinook salmon for the South Fork Nulato River. Since data gathered from ground-based sources (e.g., tower and weir counts, mark-recapture estimates) are considered more reliable than aerial survey data, escapement goals will first be evaluated using such sources having at least 5 years of information. Information from the tower counting project may be used to determine a ground based escapement goal and to re-evaluate current aerial survey escapement objectives for the Nulato River. However, escapement estimates of chinook salmon are less comparable between years because chinook salmon migrate in the deeper water where visibility varies from year.

### *Study Area*

The Nulato River is a narrow river with a substrate consisting mainly of gravel and cobble. The river is formed from two main branches, the North Fork and South Fork, which converge approximately 9 kilometer (km) above its mouth. Both forks of the Nulato River originate at an elevation of approximately 600 meter (m). From its source, the South Fork flows in a northeasterly and easterly direction about 98 km to the confluence with the North Fork. From its source, the North Fork, for the most part, also flows in a northeasterly and easterly direction. The North Fork drainage includes the Kalasik Creek drainage. The mainstem Nulato River joins the Yukon River at rkm 777 at an approximate elevation of 33 m (Sandone 1995).

The Nulato River tower site is located approximately 5 km upstream of the confluence of the Nulato and Yukon rivers (Figure 2). The water is typically clear with some brown (tannic) staining from peat and organic material along the watershed. As stated earlier, visibility in mid-river can impact the accuracy of chinook salmon counts. Nearly all of the chinook and chum salmon spawning area is upstream of the tower site.

### *Objectives*

The objectives of this project are to:

1. Estimate the total escapement of summer chum and chinook salmon into the Nulato River using tower counting methodology;
2. Estimate the age and sex composition of the summer chum spawning population;
3. Monitor climatological and hydrological conditions at the tower site.

## **METHODS**

### *Site Selection and Preparation*

The current site was selected in 1994 after completing a reconnaissance of the mainstem Nulato

River. The criteria used for selection included: 1) Location below most, if not all, chum salmon spawning areas; 2) A single, relatively narrow channel; and 3) Relatively shallow river depth to facilitate observation of migrating salmon from the towers. The south side of the river is a wide gravel bar with gradual decline and the north bank is a cut bank with a rapid decline. Prior to 1997, the north side tower was placed near the cut-bank with the deepest part of the river channel close to that bank. In 1997, the tower was moved upstream about 50 m to a location where the channel was shallower and provided a higher quality counting location. At the start of the project the maximum depth was about 2 m on the north side of the channel and the stream width at the tower site was approximately 49 m.

On the north side of the river, a single section of 3 m high steel scaffold tower was erected. On the south side of the river, two sections of scaffold were combined to make a 6 m high tower. The south bank tower was placed in the river to reduce the width of the counting area. A 15 m long weir of wire fencing and T-stakes extended from the south bank to the tower to divert fish into the counting area. To make the fish easier to see, light-colored empty sandbags were attached to a cable, extending bank to bank and weighted with sandbags. This light-colored background improved the ability of the crew to see and count fish. Observers wore polarized glasses to reduce glare. Lights were suspended on a line across the river to illuminate the counting area during hours of darkness.

### *Escapement Estimation Sampling*

Tower counting operations were conducted 7 days a week, 24 hours a day, for a 15-minute period each hour on each bank. The north bank counting period began at the top of the hour and the south bank began at the bottom of the hour. The observer counted fish passage by species and noted the direction of movement (upstream or downstream). Hand-held tally counters were used to record the observed tower counts. These counts were then transferred to data forms upon completion of a shift. Each count was expanded for each hour and each bank by dividing the count by the proportion of the hour counted. Missed counts were estimated by averaging the counts for the hours before and after the missed hourly count. When salmon were not counted for a portion of a day, the expanded total daily count for that day was estimated by dividing the expanded partial daily count by the mean proportion of the count for the corresponding hours for the day before and day after having full 24-hour counts. When counting was not conducted for a full day, the salmon passage estimate for that day was calculated as the mean salmon passage for the day before and after. When counting was not conducted for more than one full day, the passage for those days were estimated by interpolating between the last full day and first full day of counts after counting resumed.

The daily passage for each bank was calculated by summing the expanded hourly counts for each species, for each bank. The total daily passage estimate for each species was the sum of the expanded count for each bank.

### *Age-Sex-Size Sampling*

When the Nulato River tower project was initiated in 1994, run timing information did not exist for the Nulato River. Aerial survey information seemed to indicate, however, that historically the



timing of peak abundance for summer chum salmon in the Nulato River was similar to that of the Anvik River for which sonar daily passage estimates were available dating back to 1979. Strata periods for collecting age-sex-length (ASL) information were selected for the Nulato River based on those used on the Anvik River, and were described as: early, June 20 to July 3; early-middle, July 4-8; late-middle, July 9-13 and late, July 14-26 (Sandone 1995).

The sample size for each species was based on 95% precision with 10% accuracy for each time stratum. The season ASL sample size was set at 640 chum salmon with 160 chum salmon sampled in each of the strata described above. All chinook salmon captured were to be sampled. Beyond the required ASL sample, beach seining continues until an additional 200 chum salmon per stratum were caught and observed for male-female ratio. The additional 200 fish per strata, combined with the 160 summer chum salmon per strata, yielded a total sex ratio sample goal of 1,480 fish for the season on the Nulato River to define the quality of the escapement. For chinook salmon escapement, a sample size of 198 fish per stratum was the season goal based on the number of age classes that were expected in the run (Bromaghin 1993). While beach seine catches were expected to yield the desired total chum salmon sample, it was unlikely that the chinook salmon sample would be achieved due to the difficulty of catching chinook salmon by beach seine.

A beach seine 31 m long, 66 meshes deep of 6.35 centimeter (cm) mesh, was used to catch salmon for ASL samples. Captured salmon were identified by species and sex, measured to the nearest 5 millimeter (mm) (mid-eye to fork of tail), sampled for scales and adipose fin-clipped to prevent re-sampling. Scales were taken from an area posterior to the base of the dorsal fin and above the lateral line on the left side of the fish (Clutter and Whitesel 1956). One scale was taken from chum salmon and three scales were taken from chinook salmon. The scales were processed and aged post-season, and ASL data compiled and summarized.

### *Hydrological and Climatological Sampling*

Climatological and hydrological data were collected at approximately 1800 hours each day at the campsite. Stream depth was monitored on a staff gauge marked in 0.1 foot increments with measurements subsequently converted to cm. Water temperature was measured in Celsius (°C) near shore at a depth of about 0.5 m. Daily maximum and minimum air temperatures were recorded in °C using a "high-low" thermometer. Subjective notes were kept by the crew describing wind speed and direction, cloud cover and precipitation.

## **RESULTS AND DISCUSSION**

### *Escapement Estimation*

The counting towers were operated from June 20 to July 21 in 1997 (Table 1). In 1997, counting was interrupted from 2300 on July 12 to 0700 hours on July 13 due to rainy weather. The average count of the day before was used and the day after for the counting hours missed. Appendix Tables 1 through 6 present expanded hourly counts by day and by bank for chum and chinook salmon.

In 1997, the water level was low early in the season and continued to drop as the season progressed,

making boat transportation to the camp very difficult. However, because of the low water in 1997, counting conditions were generally excellent. The shallow water made sampling with a beach seine difficult because salmon did not school and hold in the areas where they previously had. Because of the current, it was difficult to keep the reflective panels and cable on the stream bottom near the north bank. On the first day of operation fish were observed passing under the cable. Additional sandbags were placed on the cable, which solved the problem.

Tower counts of summer chum salmon are thought to be a good estimate of the total escapement passage spatial distribution of summer chum salmon is normally close to the riverbank. In 1994, Sandone (1995) observed that chinook salmon typically travel in the deepest part of the channel or near the middle of the river, where many were probably not seen and counted. Therefore counts of chinook salmon were most likely below the actual escapement except in 1997. In 1997, the middle portion of the river was shallow and clear enough to permit reliable counting from the towers.

### **Chinook Salmon**

The total estimated chinook salmon escapement into the Nulato River during the period June 20 through July 21 was 4,766 with 2,864 estimated for the South Bank and 1,902 estimated for the North Bank (Table 1). No chinook salmon were observed until the fourth day of tower operation. Figure 3 illustrates the relative passage rate estimate by day for each bank. A spatial pattern was observed in chinook salmon as the salmon passed the tower site with 60.1% of the estimated total passage occurring on the south bank.

The first quartile day of passage occurred on July 4, the second earliest of the four years of tower operation. The median day occurred on July 8, and the last quartile occurred on July 13 (Table 1). The total chinook salmon estimated escapement was more than 2.5 times larger than the three previous years (Table 6) with run timing the second earliest recorded (Figure 4). Caution should be used when comparing chinook salmon between years. Chinook salmon migrate in mid-river and years may not be comparable because of the variation of water clarity.

Chinook salmon generally migrated upriver with the highest passage typically occurring between 1600 and 1900 hours and the lowest passage occurring between 0300 and 0500 hours (Table 3, Figure 5).

The aerial survey escapement goal for chinook salmon was 500 for the South Fork and 800 for the North Fork. While no aerial survey was flown in 1997 due to poor weather conditions, the estimated chinook salmon escapement based on tower counts indicates the escapement goal for both forks was most likely achieved. Too few chinook salmon were caught in the beach seines to make an analysis of age and sex composition of the chinook run. Since no carcass sampling project was conducted on the Nulato River, no escapement age and sex information is available.

### **Summer Chum Salmon**

The estimated summer chum salmon escapement from June 20 through July 21 was 104,859 on the South Bank and 53,312 on the North Bank for a total of 158,171 chum salmon Table 1 and Figure



3. This was the second highest escapement estimate during the four years of counting tower operation (Table 7, Figure 4). The run was second earliest documented during the four years of tower operation. The first quartile occurred on June 30, the mid-point of the run occurred on July 5 and the third quartile occurred on July 8.

Passage of summer chum salmon in the Nulato River demonstrated a distinct spatial and diurnal pattern. These patterns have also been previously noted in this system and on the Anvik River (Sandone 1995). In 1997, 66.3% of the run was counted on the South Bank, the side of the river with the wide gravel bar and gradual decline, and the remaining fish passing the North Bank which is characterized with a steep decline (Table 1, Figure 3). Hourly counts increased steadily in the afternoon on both banks, typically peaking between 1700 and 1800 hours, then decreased to the lowest passage rate period occurring between 0300 and 1200 hours (Table 3, Figure 5).

The distribution of counts by day verifies observations by the crew that the preponderance of the run passed the tower site during counting operations, with counts increasing during the first few days and tapering off during the last week (Table 2, Figure 3). Daily passage estimates of summer chum salmon reached above 10,000 on July 4 with counts of that magnitude continuing through July 7 when the run began to taper off. Of the 32-day counting period, there were only 9 days between the 1<sup>st</sup> and 3<sup>rd</sup> quartile.

A comparison of Nulato River summer chum salmon timing for the years 1994-1997 is presented in Table 7 and Figure 4. The data illustrates that the Nulato River escapement timing in 1997 was earlier than 1994, similar to 1995 and later than 1996. Daily passage rates, however, did not reach the magnitude recorded in 1995 and upstream migration was essentially over by July 21 (Figure 3). The estimated total Nulato River summer chum salmon escapement from the counting tower data could not be compared with aerial survey estimates in 1997 because no aerial survey was conducted due to poor weather.

Sandone (1995) evaluated run timing information using test fishing catch rates, Yukon River sonar passage estimates and escapements into the Anvik, Kaltag and Nulato Rivers to determine run timing relationships for summer chum salmon migrating into the Nulato River. Comparisons between historical relative abundance data from aerial surveys and the 1994 Nulato River tower data suggested that run timing into the three spawning escapement tributaries was similar. Sandone (1995) cites swimming speed analyses using lower Yukon River test fishing data and Anvik River sonar data, that summer chum salmon have an estimated average travel speed of 42 km per day. Based on this statistic, there was indication that fish spawning farther upriver passed by the Yukon River sonar site earlier than those spawning in tributaries lower in the river. Although there are indications that stocks may be entering the Yukon River at different times, aerial surveys conducted during peak spawning indicate that spawn timing of these stocks typically occur at the same time.

#### *Age-Sex-Size*

Nulato escapement ASL sampling was completed on 597 summer chum salmon that were captured by beach seine. Sampling was conducted approximately 100 m upstream from the north (left) bank tower during the early portion of the season. Due to changes in water flow and water depth, A

second site was necessary later in the run because adequate numbers of fish were no longer available at the original site. For the pooled sample weighted by escapement, 23% were age-0.3 fish and 73% were age-0.4 fish and 4% being age 0.5-fish (Table 4). The weighted sex ratio was 48% female and 52% male. Mean lengths ranged from 545.8 mm to 585.0 for females and 571.8 mm to 606.3 mm for males. For females, mean length increase corresponded with the age of the fish. For males however, of the three age groups, the mean length for age-0.4 fish was the greatest.

Age-0.4 fish predominated in all 5 strata followed by age-0.3 fish and age-0.5 fish. Sex composition was nearly equal across all age groups for the season (Figure 6, Appendix Table B.1.). Sex composition in each stratum did change after the first sampling period. In the first stratum, males were predominant but as the season progressed, the sex composition changed with females being predominant for the three out of the four remaining strata.

### *Hydrology and Climate*

For most tributaries of the Yukon River, it is common for the water to be highest during or shortly after breakup, then generally continue to drop during the summer as the snow pack decreases. Storage capacity of the Nulato River watershed, similar to the Anvik, appears to be minimal with limited retention of rainfall in the upper areas of the drainage and has rapid changes in water depth when substantial rainfall occurs. These flood conditions make counting difficult or impossible because of the suspended solids, detritus, tannic staining and increased water depth.

For the Nulato River drainage, rainfall was minimal in 1997 with only four days of intermittent rainfall (Table 5). The highest water level was recorded on June 21, the first day of counting operations (Figure 6). Water temperatures ranged from 13.3°C to 15.6°C during the season. The range for the low air temperature was from 3.9°C to 16.1°C and for the high temperature was 16.1°C to 32.2°C.

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## TABLES AND FIGURES



Table 1. Nulato River tower daily expanded counts for chinook and summer chum salmon by bank and daily total, 1997.

Date	Chinook salmon expanded counts			Chum salmon expanded counts		
	South Bank	North Bank	Total	South Bank	North Bank	Total
20-Jun <sup>a</sup>	0	0	0	44	20	64
21-Jun	0	0	0	80	88	168
22-Jun	0	0	0	264	260	524
23-Jun	16	4	20	1,480	864	2,344
24-Jun	0	16	16	2,660	1,156	3,816
25-Jun	8	8	16	3,148	1,708	4,856
26-Jun	16	16	32	2,756	1,836	4,592
27-Jun	32	20	52	2,132	1,736	3,868
28-Jun	60	24	84	3,004	1,812	4,816
29-Jun	64	72	136	3,980	2,992	6,972
30-Jun	100	44	144	4,584	3,332	7,916
01-Jul	64	80	144	4,816	2,840	7,656
02-Jul	132	40	172	6,388	2,512	8,900
03-Jul	132	52	184	6,756	1,840	8,596
04-Jul	196	148	344	8,676	3,756	12,432
05-Jul	224	112	336	8,340	3,092	11,432
06-Jul	188	164	352	7,124	3,624	10,748
07-Jul	168	140	308	6,864	4,504	11,368
08-Jul	216	152	368	6,784	3,160	9,944
09-Jul	100	112	212	3,476	1,188	4,664
10-Jul	240	104	344	5,412	1,976	7,388
11-Jul	68	60	128	2,396	1,360	3,756
12-Jul <sup>b</sup>	66	86	152	2,555	1,598	4,153
13-Jul <sup>b</sup>	182	108	290	2,300	1,258	3,558
14-Jul	28	80	108	1,516	740	2,256
15-Jul	164	88	252	1,932	1,084	3,016
16-Jul	152	32	184	2,088	928	3,016
17-Jul	80	28	108	1,612	780	2,392
18-Jul	32	20	52	532	392	924
19-Jul	48	20	68	660	420	1,080
20-Jul	64	52	116	404	356	760
21-Jul <sup>c</sup>	24	20	44	96	100	196
Totals	2,864	1,902	4,766	104,859	53,312	158,171

<sup>a</sup> Counting initiated at 1900, 20 June.

<sup>b</sup> Counts for missed hours due to rain and darkness (June 12, 23:00 to July 13, 06:00) were interpolated.

<sup>c</sup> Counting discontinued at 1600, 21 July.

Table 2. Nulato River tower daily and cumulative counts and proportions for chinook and summer chum salmon, 1997.

Date	Chinook Salmon				Summer Chum Salmon			
	Counts		Proportions		Counts		Proportions	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
20-Jun <sup>a</sup>	0	0	0.000	0.000	64	64	0.000	0.000
21-Jun	0	0	0.000	0.000	168	232	0.001	0.001
22-Jun	0	0	0.000	0.000	524	756	0.003	0.005
23-Jun	20	20	0.004	0.004	2,344	3,100	0.015	0.020
24-Jun	16	36	0.003	0.008	3,816	6,916	0.024	0.044
25-Jun	16	52	0.003	0.011	4,856	11,772	0.031	0.074
26-Jun	32	84	0.007	0.018	4,592	16,364	0.029	0.103
27-Jun	52	136	0.011	0.029	3,868	20,232	0.024	0.128
28-Jun	84	220	0.018	0.046	4,816	25,048	0.030	0.158
29-Jun	136	356	0.029	0.075	6,972	32,020	0.044	0.202
30-Jun	144	500	0.030	0.105	7,916	39,936	0.050	0.252
01-Jul	144	644	0.030	0.135	7,656	47,592	0.048	0.301
02-Jul	172	816	0.036	0.171	8,900	56,492	0.056	0.357
03-Jul	184	1,000	0.039	0.210	8,596	65,088	0.054	0.412
04-Jul	344	1,344	0.072	0.282	12,432	77,520	0.079	0.490
05-Jul	336	1,680	0.070	0.352	11,432	88,952	0.072	0.562
06-Jul	352	2,032	0.074	0.426	10,748	99,700	0.068	0.630
07-Jul	308	2,340	0.065	0.491	11,368	111,068	0.072	0.702
08-Jul	368	2,708	0.077	0.568	9,944	121,012	0.063	0.765
09-Jul	212	2,920	0.044	0.613	4,664	125,676	0.029	0.795
10-Jul	344	3,264	0.072	0.685	7,388	133,064	0.047	0.841
11-Jul	128	3,392	0.027	0.712	3,756	136,820	0.024	0.865
12-Jul <sup>b</sup>	152	3,544	0.032	0.744	4,153	140,973	0.026	0.891
13-Jul <sup>b</sup>	290	3,834	0.061	0.804	3,558	144,531	0.022	0.914
14-Jul	108	3,942	0.023	0.827	2,256	146,787	0.014	0.928
15-Jul	252	4,194	0.053	0.880	3,016	149,803	0.019	0.947
16-Jul	184	4,378	0.039	0.919	3,016	152,819	0.019	0.966
17-Jul	108	4,486	0.023	0.941	2,392	155,211	0.015	0.981
18-Jul	52	4,538	0.011	0.952	924	156,135	0.006	0.987
19-Jul	68	4,606	0.014	0.966	1,080	157,215	0.007	0.994
20-Jul	116	4,722	0.024	0.991	760	157,975	0.005	0.999
21-Jul <sup>c</sup>	44	4,766	0.009	1.000	196	158,171	0.001	1.000

<sup>a</sup> Counting initiated at 1900, 20 June.

<sup>b</sup> Counts for missed hours due to rain and darkness (June 12, 23:00 to July 13, 06:00) were interpolated.

<sup>c</sup> Counting discontinued at 1600, 21 July.



Table 3. Season total counts and proportions by hour for Nulato River chinook and summer chum salmon, 1997.

Hour Ending	Chinook Salmon		Summer Chum Salmon	
	Counts	Proportions	Counts	Proportions
1:00	92	0.019	5,787	0.037
2:00	44	0.009	4,319	0.027
3:00	60	0.013	4,025	0.025
4:00	16	0.003	3,936	0.025
5:00	92	0.019	3,908	0.025
6:00	78	0.016	3,775	0.024
7:00	124	0.026	3,304	0.021
8:00	156	0.033	3,424	0.022
9:00	164	0.034	3,384	0.021
10:00	168	0.035	3,608	0.023
11:00	144	0.030	4,040	0.026
12:00	136	0.029	4,152	0.026
13:00	236	0.050	4,956	0.031
14:00	312	0.065	7,584	0.048
15:00	280	0.059	8,580	0.054
16:00	408	0.086	10,980	0.069
17:00	424	0.089	14,344	0.091
18:00	424	0.089	14,584	0.092
19:00	288	0.060	10,496	0.066
20:00	348	0.073	9,960	0.063
21:00	276	0.058	8,144	0.051
22:00	248	0.052	7,676	0.049
23:00	148	0.031	6,875	0.043
0:00	100	0.021	6,330	0.040

Table 5. Nulato River tower project climatological and hydrological observations, 1997.

Date	Time	Precipitation (code\amt)	Wind (Direction and) Velocity	Sky (code)	Temperature (°C)			Water Gauge ( cm )	Water Color (code)	Remarks
					Air Min	Air Max	Water			
19-Jun										
20-Jun										
21-Jun	1800	0	N 10	2	8.9	23.9		30.5	Cl	No thermometer
22-Jun	1800	0	N 5	1	6.7	25.0		29.6	Cl	Yukon rising
23-Jun	1800	0	N 2	3	6.7	25.6		27.4	Cl	River level dropping
24-Jun	1800	0	0	3	16.1	27.8		25.9	Cl	Yukon still rising
25-Jun	1800	0	0	2	16.1	31.7		24.4	Cl	Too warm
26-Jun	1800	0	N 5	2	8.9	30.6	14.4	24.4	Cl	Clouding over and cooling
27-Jun	1800	0	N 15	1	7.8	27.8	14.4	24.4	Cl	Cooling
28-Jun	1800	0	S 10	2	8.3	29.4	15.0	21.3	Cl	
29-Jun	1800	0	0	3	8.9	28.9	15.0	21.3	Cl	
30-Jun	2000	0	0	3	10.0	31.7	15.0	18.3	Cl	Smokey
01-Jul	1800	0	0	3	11.7	26.7	13.9	18.3	Cl	Very cloudy
02-Jul	1800	I	S 50	3	11.7	23.9	13.9	18.3	Cl	Very hot
03-Jul	1800	0	0	2	11.7	27.8	14.4	18.3	Cl	Very cloudy
04-Jul	1830	0	0	3	15.0	32.2	15.0	18.3	Cl	Increasing clouds in afternoon
05-Jul	1800	0	S 10	3	14.4	31.7	15.6	18.3	Cl	Cloudy, no rain
06-Jul	1800	0	N 5	3	12.2	28.3	15.6	18.3	Cl	Cloudy, no rain
07-Jul	1800	0	N 5	3	9.4	26.7	14.4	18.3	Cl	
08-Jul	1800	0	S 10	3	10.0	26.1	14.4	18.3	Cl	Some rain
09-Jul	1800	I	S 10	4	9.4	21.7	14.4	18.3	Cl	Windy, cool
10-Jul	1800	I	N 15	3	11.1	20.0	13.3	18.3	Cl	Very windy
11-Jul	1800	0	N 5	4	5.0	16.1	14.4	15.2	Cl	Cooling
12-Jul	1800	0	N 5	4	3.9	21.1	13.9	15.2	Cl	Cool night
13-Jul	1800	0	N 10	3	3.9	17.2	15.6	15.2	Cl	Very windy
14-Jul	1800	0	0	4	3.9	17.2	15.6	15.2	Cl	Dark day
15-Jul	1800	0	0	2	3.9	25.0	15.0	18.3	Cl	Nice day
16-Jul	1800	0	0	4	8.9	27.8	15.0	18.3	Cl	Warm and smokey
17-Jul	1800	0	N 10	3	14.4	26.7	14.4	18.3	Cl	Very windy with thunder
18-Jul	1800	0	0	3	9.4	22.8	14.4	18.3	Cl	Very smokey
19-Jul	1800	0	0	2	10.0	26.7	15.0	18.3	Cl	Smokey and warm
20-Jul	1800	I	0	4	10.6	22.8	15.6	18.3	Cl	intermittent rain

Codes		
SKY	PRECIPITATION	WATER COLOR
0 No observation made	I Intermittent rain	Clr Clear
1 Clear sky, not over 10% cloud cover	R Continuous rain	Dk gm Dark green
2 Cloud cover not over 50%	S Snow	Lt gm Light green
3 Cloud cover over 50% of sky	S&R Mixed snow & rain	Br Brown
4 Completely overcast	H Hail	Dk Dark Brown
5 Fog or thick haze or smoke	T Thunder showers	Tr Turbid: murky or glacial

Table 4. Nulato River summer chum salmon weighted age and sex composition and mean length, 1997.

		Brood Year and Age Group			Total
		1993 0.3	1992 0.4	1991 0.5	
Female	No. in Escapement	17,955	56,830	1,269	76,054
	Percent of Sample	11.4	35.9	0.8	48.1
	Mean Length (mm)	545.8	568.9	585.0	
	Std. Deviation	29.7	24.4	20.0	
Male	No. in Escapement	18,303	59,055	4,759	82,117
	Percent of Sample	11.6	37.3	3.0	51.9
	Mean Length (mm)	571.8	606.3	594.5	
	Std. Deviation	34.4	28.2	26.5	
Total	No. in Escapement	36,258	115,885	6,028	158,171
	Percent of Sample	22.9	73.3	3.8	100.0

Table 6. Historic daily and cumulative Nulato River chinook salmon escapement, 1994-1997.

Date	1994			1995			1996			1997		
	Daily Counts	Cumulative Counts	Cumulative Proportion	Daily Counts	Cumulative Counts	Cumulative Proportion	Daily Counts	Cumulative Counts	Cumulative Proportion	Daily Counts	Cumulative Counts	Cumulative Proportion
15-Jun												
16-Jun												
17-Jun												
18-Jun												
19-Jun												
20-Jun										0	0	0.00
21-Jun										0	0	0.00
22-Jun										0	0	0.00
23-Jun										20	20	0.00
24-Jun										16	36	0.01
25-Jun										16	52	0.01
26-Jun				4	4	0.00	12	12	0.02	32	84	0.02
27-Jun				4	8	0.01	12	24	0.03	52	136	0.03
28-Jun				0	8	0.01	8	32	0.04	84	220	0.05
29-Jun				0	8	0.01	4	36	0.05	136	356	0.07
30-Jun				0	8	0.01	8	44	0.06	144	500	0.10
1-Jul				8	16	0.01	12	56	0.07	144	644	0.14
2-Jul				0	16	0.01	8	64	0.08	172	816	0.17
3-Jul				12	28	0.02	13	77	0.10	184	1,000	0.21
4-Jul	0	0	0.00	24	52	0.04	19	96	0.13	344	1,344	0.28
5-Jul	3	3	0.00	64	116	0.08	24	120	0.16	336	1,680	0.35
6-Jul	6	9	0.01	44	160	0.11	48	168	0.22	352	2,032	0.43
7-Jul	72	81	0.05	36	196	0.14	40	208	0.28	308	2,340	0.49
8-Jul	72	153	0.09	8	204	0.14	8	216	0.29	368	2,708	0.57
9-Jul	60	213	0.12	16	220	0.16	12	228	0.30	212	2,920	0.61
10-Jul	216	429	0.24	52	272	0.19	108	336	0.44	344	3,264	0.68
11-Jul	208	637	0.35	100	372	0.26	36	372	0.49	128	3,392	0.71
12-Jul	120	757	0.42	52	424	0.30	80	452	0.60	152	3,544	0.74
13-Jul	84	841	0.47	112	536	0.38	52	504	0.67	290	3,834	0.80
14-Jul	92	933	0.52	84	620	0.44	48	552	0.73	108	3,942	0.83
15-Jul	100	1,033	0.58	56	676	0.48	16	568	0.75	252	4,194	0.88
16-Jul	112	1,145	0.64	60	736	0.52	36	604	0.80	184	4,378	0.92
17-Jul	92	1,237	0.69	164	900	0.64	64	668	0.88	108	4,486	0.94
18-Jul	96	1,333	0.74	56	956	0.68	16	684	0.90	52	4,538	0.95
19-Jul	100	1,433	0.80	56	1,012	0.72	16	700	0.93	68	4,606	0.97
20-Jul	104	1,537	0.86	76	1,088	0.77	24	724	0.96	116	4,722	0.99
21-Jul	44	1,581	0.88	92	1,180	0.84	24	748	0.99	44	4,766	1.00
22-Jul	51	1,632	0.91	56	1,236	0.88	8	756	1.00			
23-Jul	40	1,672	0.93	28	1,264	0.90	0	756	1.00			
24-Jul	43	1,715	0.96	72	1,336	0.95	0	756	1.00			
25-Jul	28	1,743	0.97	48	1,384	0.98						
26-Jul	12	1,755	0.98	28	1,412	1.00						
27-Jul	8	1,763	0.98									
28-Jul	32	1,795	1.00									
29-Jul												
30-Jul												
31-Jul												
	1,795			1,412			756			4,766		

Table 7. Historic daily and cumulative Nulato River summer chum salmon escapement, 1994-1997.

Date	1994			1995			1996			1997		
	Daily Counts	Cumulative Counts	Cumulative Proportion	Daily Counts	Cumulative Counts	Cumulative Proportion	Daily Counts	Cumulative Counts	Cumulative Proportion	Daily Counts	Cumulative Counts	Cumulative Proportion
15-Jun												
16-Jun												
17-Jun												
18-Jun												
19-Jun												
20-Jun										64	64	0.00
21-Jun				452	452	0.00	700	700	0.01	168	232	0.00
22-Jun				692	1,144	0.00	3,684	4,384	0.03	524	756	0.00
23-Jun				1,056	2,200	0.01	6,612	10,996	0.08	2,344	3,100	0.02
24-Jun				1,880	4,080	0.02	6,680	17,676	0.14	3,816	6,916	0.04
25-Jun				1,612	5,692	0.02	7,196	24,872	0.19	4,856	11,772	0.07
26-Jun				2,044	7,736	0.03	6,792	31,664	0.24	4,592	16,364	0.10
27-Jun				10,884	18,620	0.08	2,082	33,746	0.26	3,868	20,232	0.13
28-Jun				5,196	23,816	0.10	3,812	37,558	0.29	4,816	25,048	0.16
29-Jun	2,001	2,001	0.01	9,184	33,000	0.14	5,542	43,100	0.33	6,972	32,020	0.20
30-Jun	8,355	10,356	0.07	7,188	40,188	0.17	7,271	50,371	0.39	7,916	39,936	0.25
1-Jul	7,898	18,254	0.12	9,716	49,904	0.21	7,104	57,475	0.44	7,656	47,592	0.30
2-Jul	9,604	27,858	0.19	15,110	65,014	0.27	6,076	63,551	0.49	8,900	56,492	0.36
3-Jul	7,601	35,459	0.24	9,068	74,082	0.31	3,624	67,175	0.52	8,596	65,088	0.41
4-Jul	6,708	42,167	0.28	11,064	85,146	0.36	5,484	72,659	0.56	12,432	77,520	0.49
5-Jul	10,188	52,355	0.35	12,700	97,846	0.41	8,320	80,979	0.62	11,432	88,952	0.56
6-Jul	8,092	60,447	0.41	18,504	116,350	0.49	4,968	85,947	0.66	10,748	99,700	0.63
7-Jul	7,008	67,455	0.45	10,704	127,054	0.54	7,460	93,407	0.72	11,368	111,068	0.70
8-Jul	4,704	72,159	0.49	11,960	139,014	0.59	5,728	99,135	0.76	9,944	121,012	0.77
9-Jul	9,232	81,391	0.55	14,008	153,022	0.65	3,664	102,799	0.79	4,664	125,676	0.79
10-Jul	10,744	92,135	0.62	14,004	167,026	0.71	7,104	109,903	0.85	7,388	133,064	0.84
11-Jul	8,776	100,911	0.68	13,684	180,710	0.76	4,144	114,047	0.88	3,756	136,820	0.87
12-Jul	7,327	108,238	0.73	11,356	192,066	0.81	4,224	118,271	0.91	4,153	140,973	0.89
13-Jul	6,931	115,169	0.77	8,660	200,726	0.85	3,888	122,159	0.94	3,558	144,531	0.91
14-Jul	6,535	121,704	0.82	5,172	205,898	0.87	3,132	125,291	0.97	2,256	146,787	0.93
15-Jul	6,140	127,844	0.86	4,232	210,130	0.89	1,920	127,211	0.98	3,016	149,803	0.95
16-Jul	4,440	132,284	0.89	6,728	216,858	0.92	916	128,127	0.99	3,016	152,819	0.97
17-Jul	3,211	135,495	0.91	6,464	223,322	0.94	676	128,803	0.99	2,392	155,211	0.98
18-Jul	3,332	138,827	0.93	3,716	227,038	0.96	520	129,323	1.00	924	156,135	0.99
19-Jul	2,215	141,042	0.95	4,400	231,438	0.98	371	129,694	1.00	1,080	157,215	0.99
20-Jul	1,712	142,754	0.96	3,368	234,806	0.99				760	157,975	1.00
21-Jul	1,208	143,962	0.97	2,084	236,890	1.00				196	158,171	1.00
22-Jul	2,808	146,770	0.99									
23-Jul	1,992	148,762	1.00									
24-Jul												
25-Jul												
26-Jul												
27-Jul												
28-Jul												
29-Jul												
30-Jul												
31-Jul												
Total	148,762			236,890			129,694			158,171		

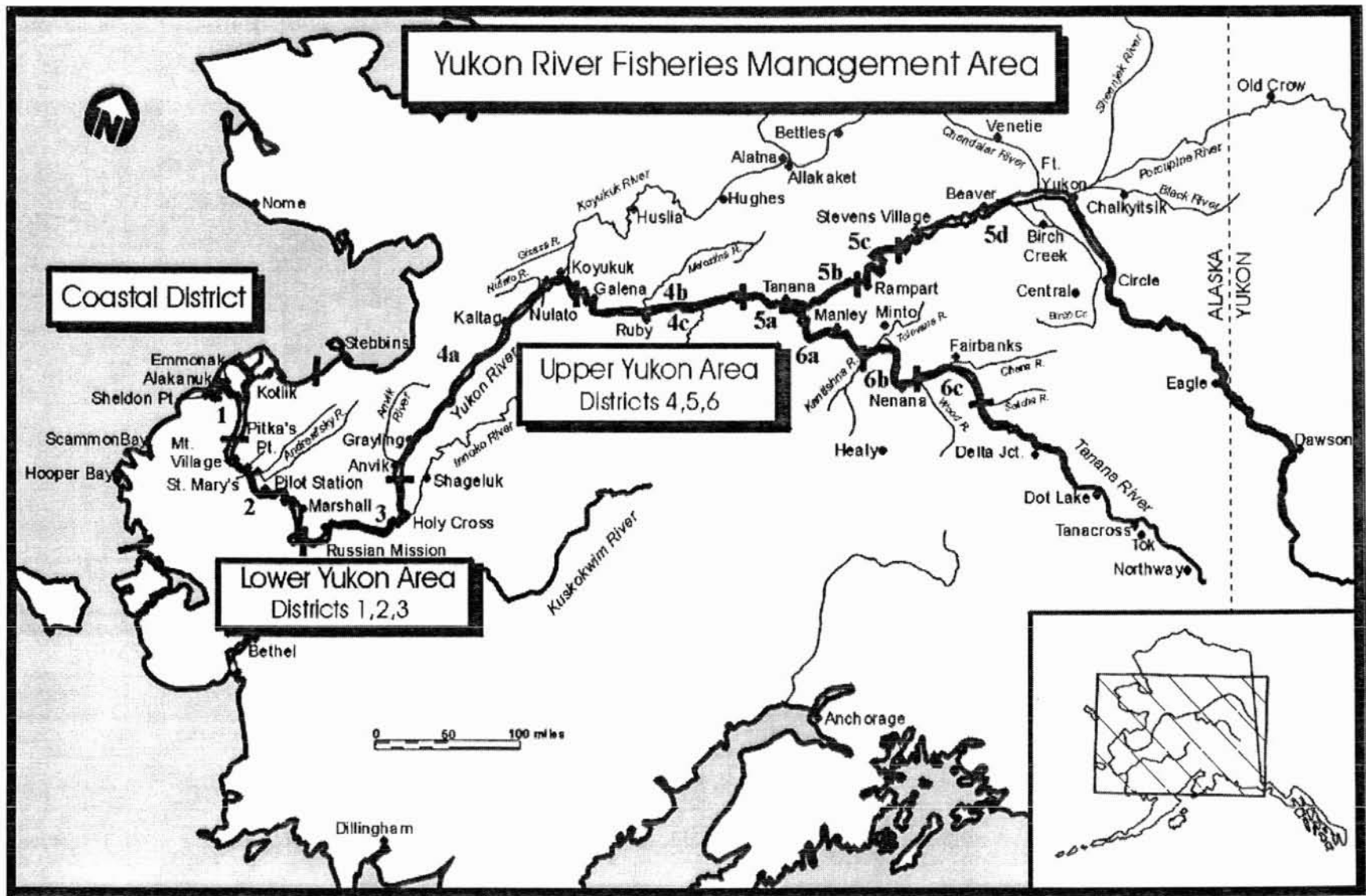


Figure 1. Alaskan portion of the Yukon River showing villages and fishing district boundaries.

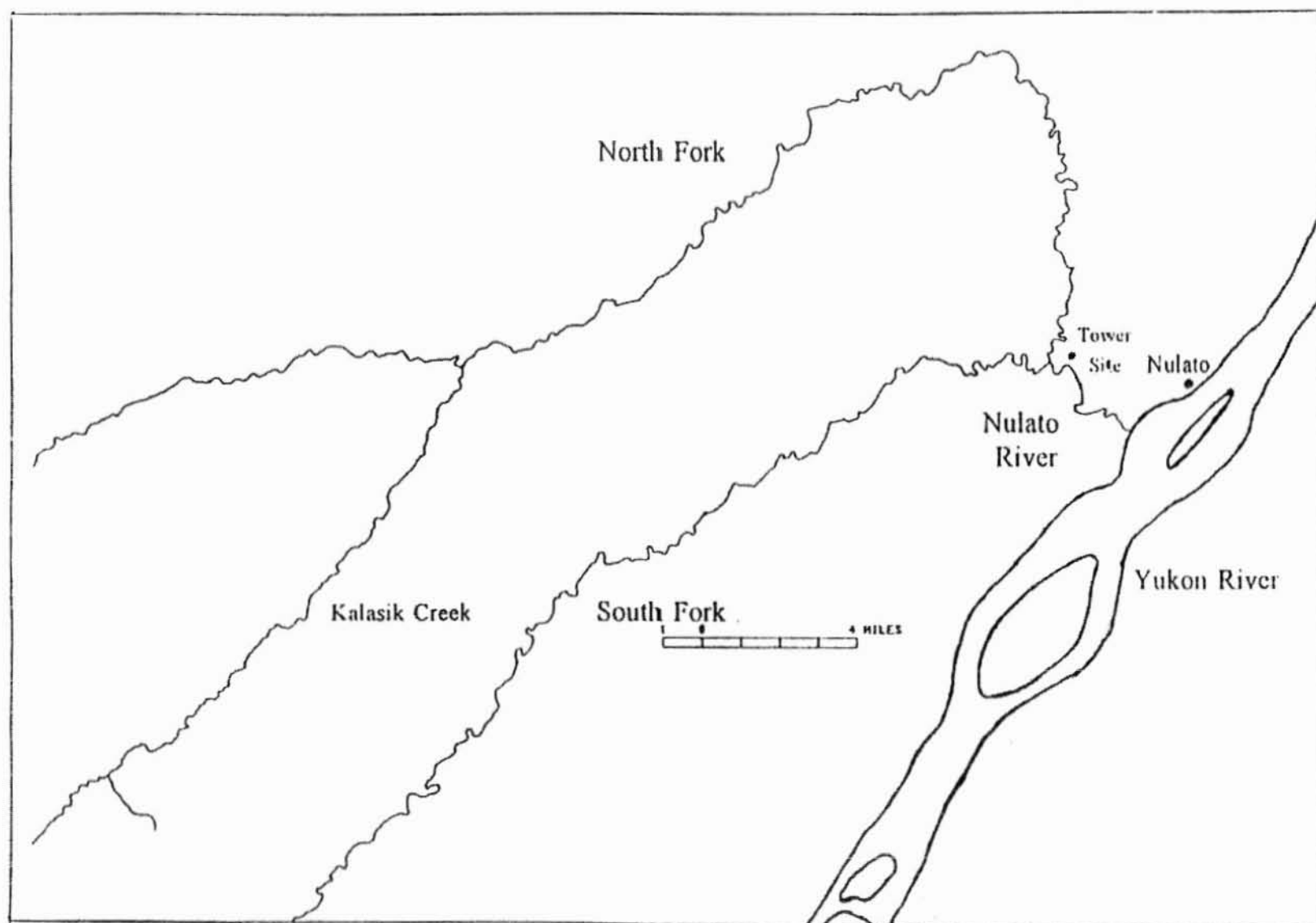


Figure 2. The Nulato River drainage showing the counting tower site in 1997.

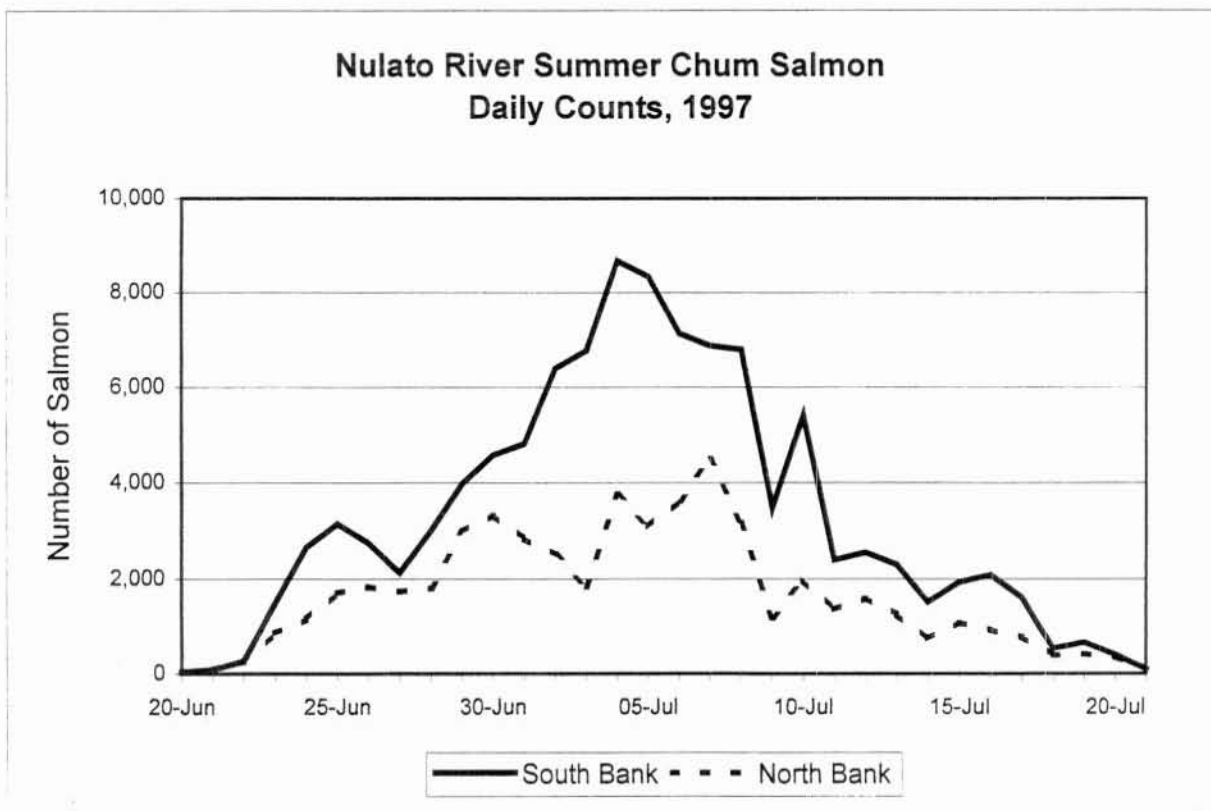
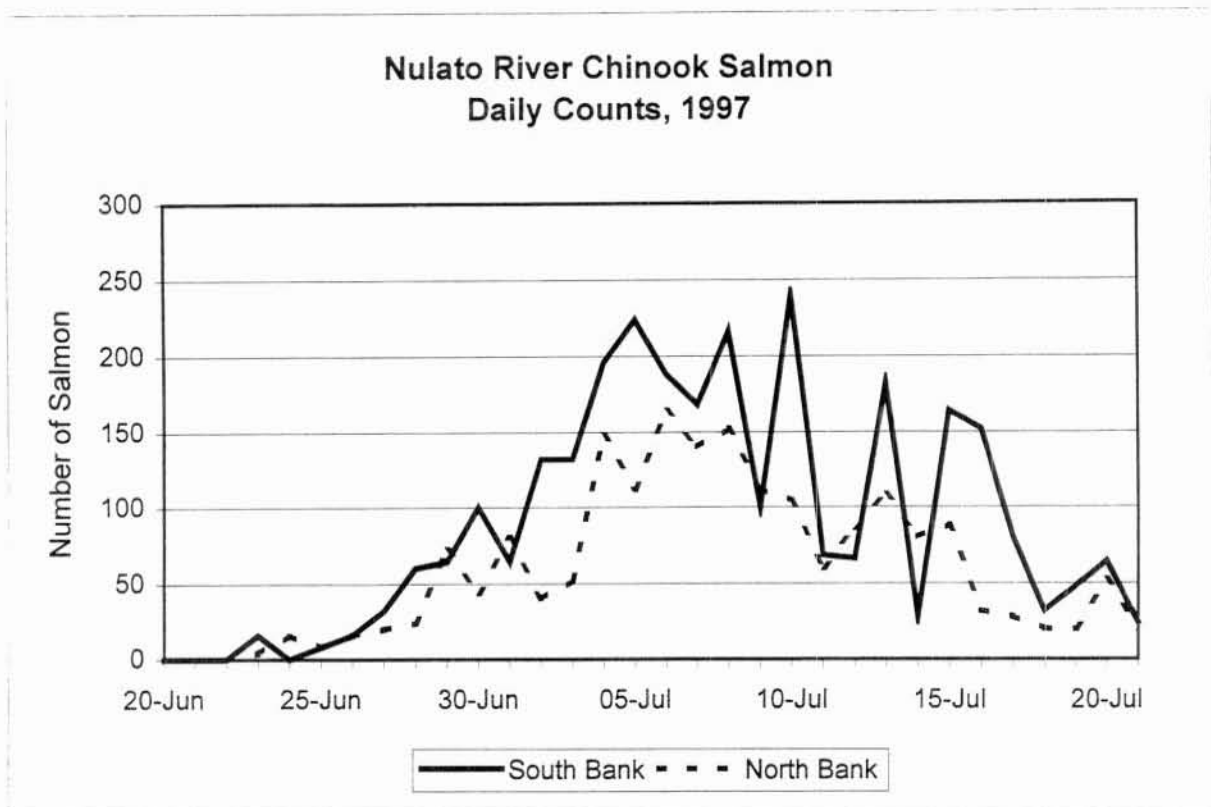


Figure 3. Nulato River chinook and summer chum salmon daily counts by bank, 1997.



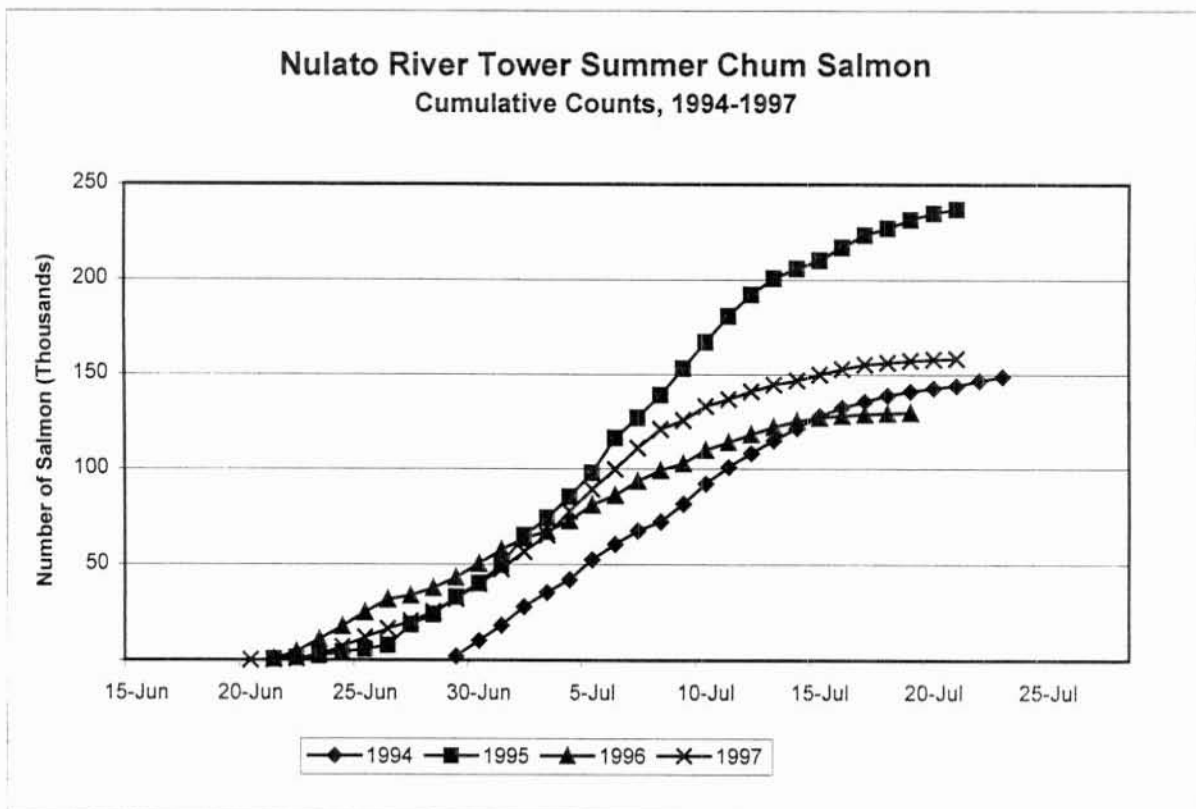
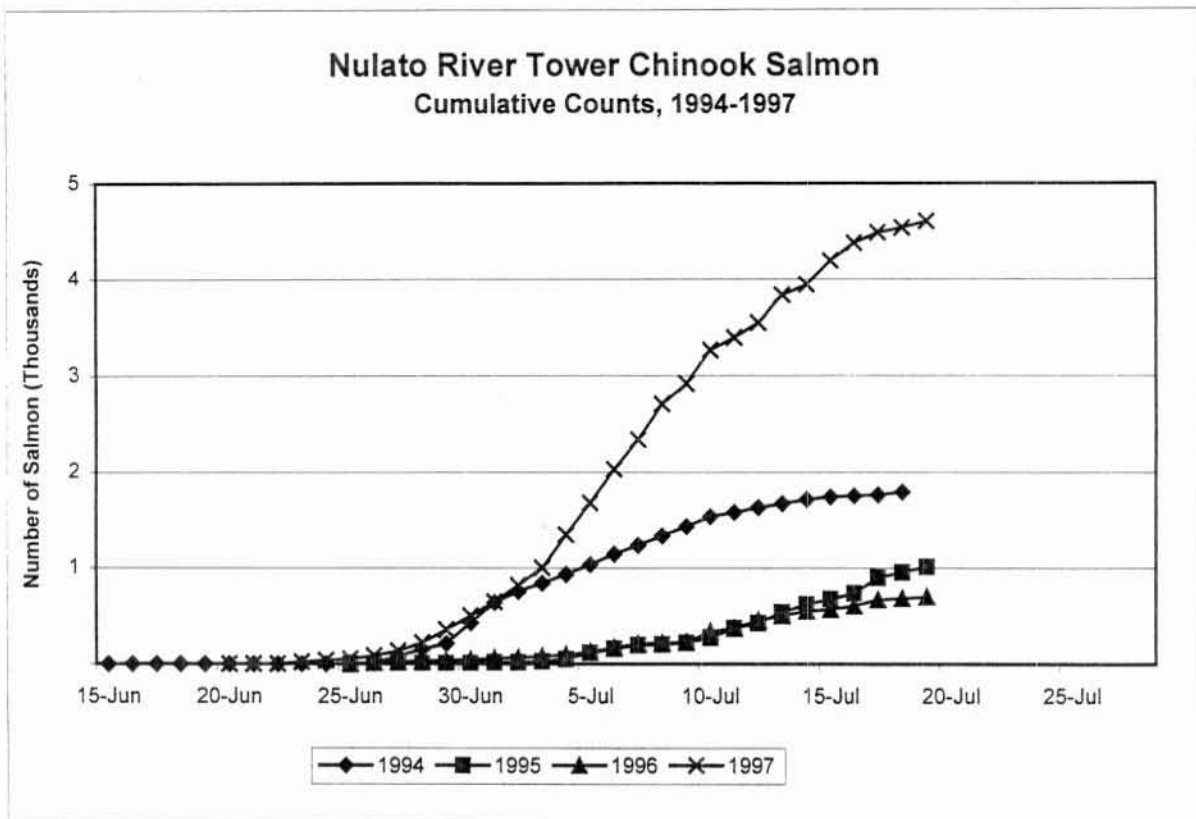


Figure 4. Nulato River chinook and summer chum salmon cumulative counts, 1994-1997.

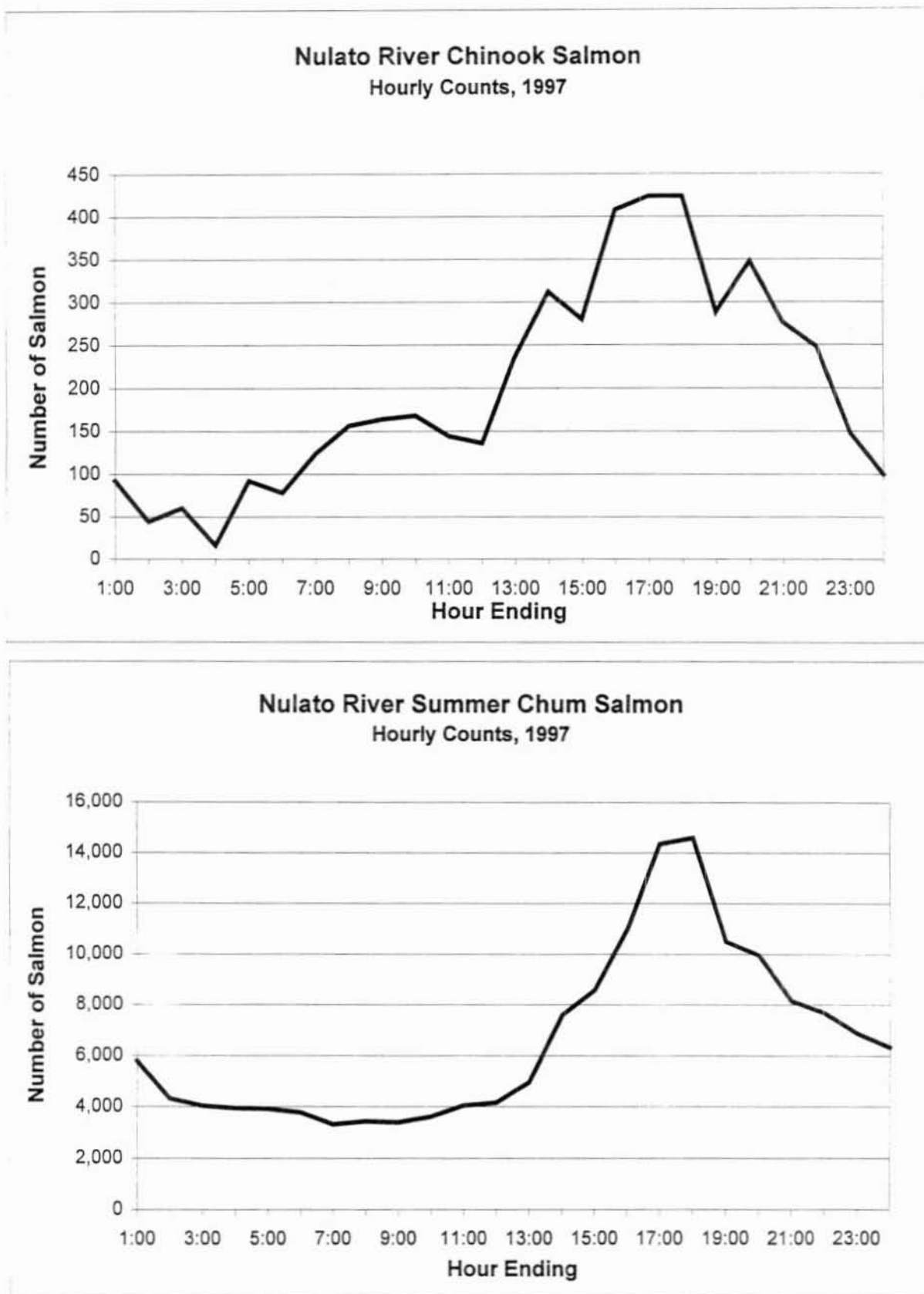


Figure 5. Season total counts by hour for Nulato River chinook and summer chum salmon, 1997.

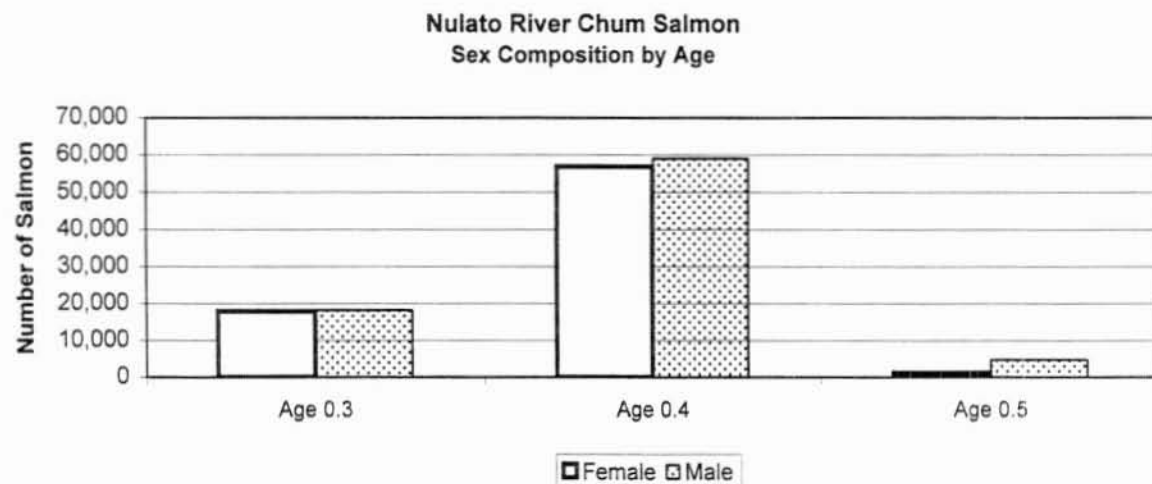
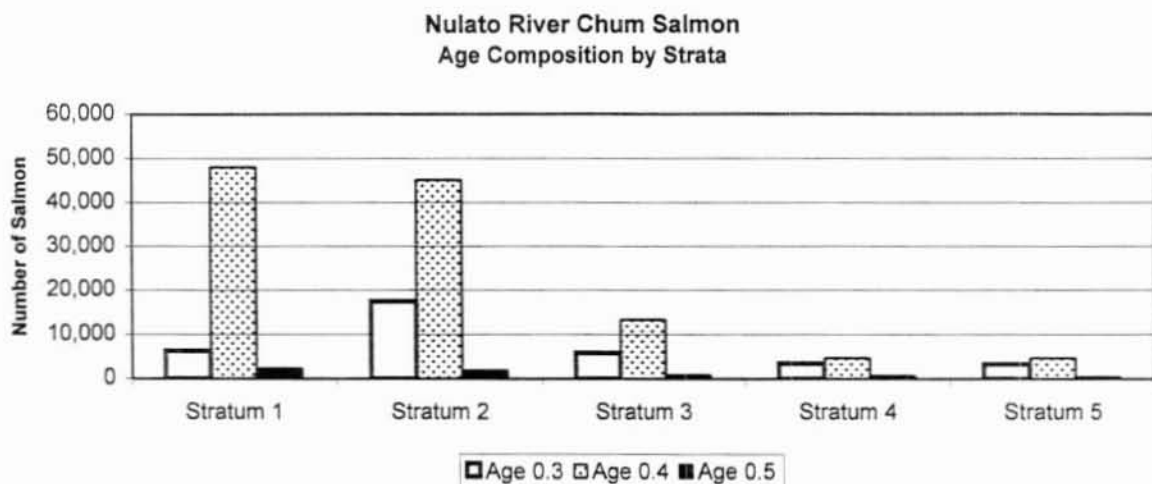
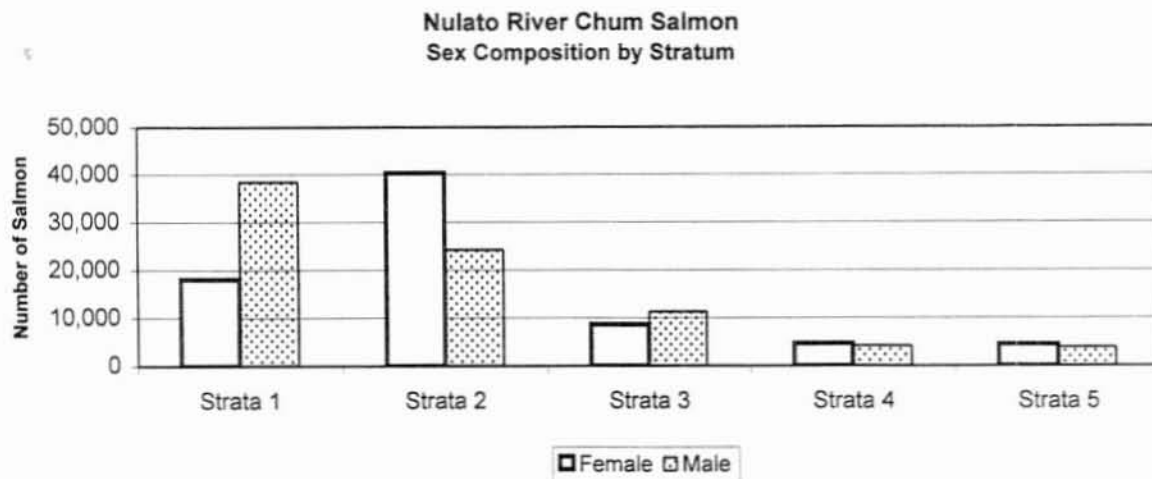


Figure 6. Nulato River age and sex composition by stratum, and sex composition by age group, 1997.

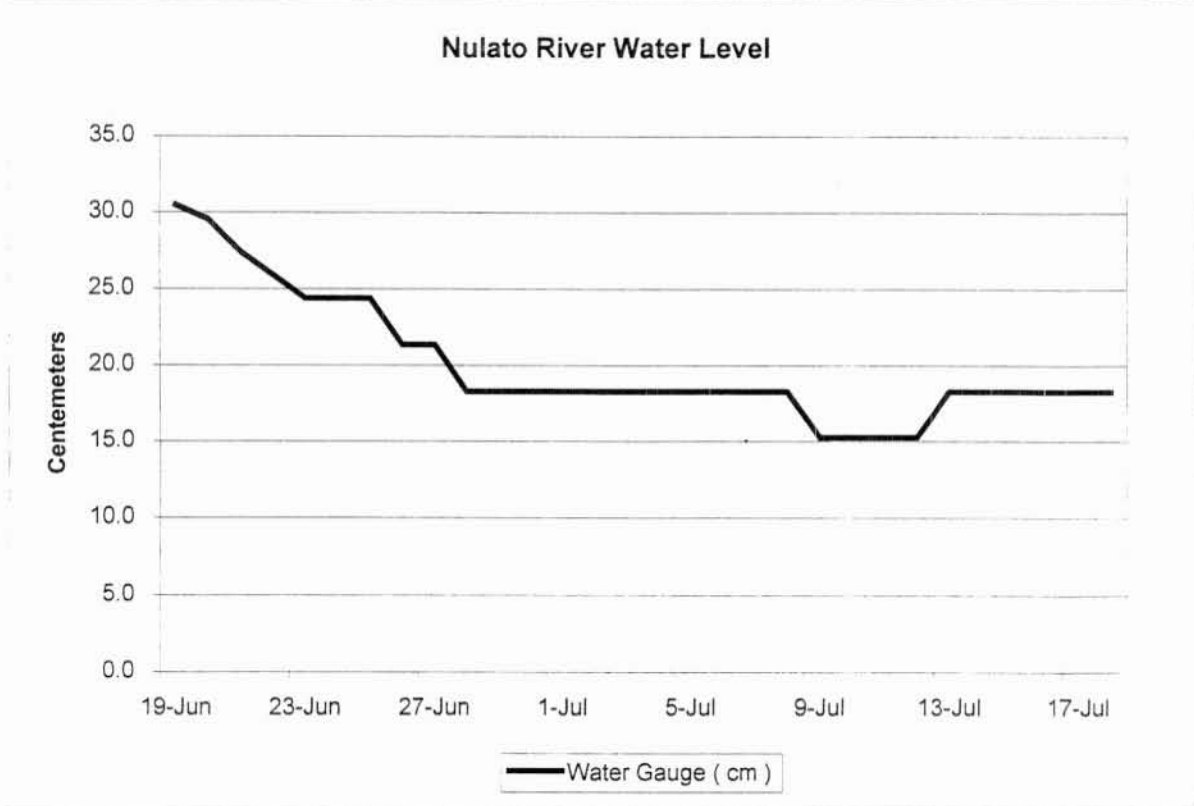
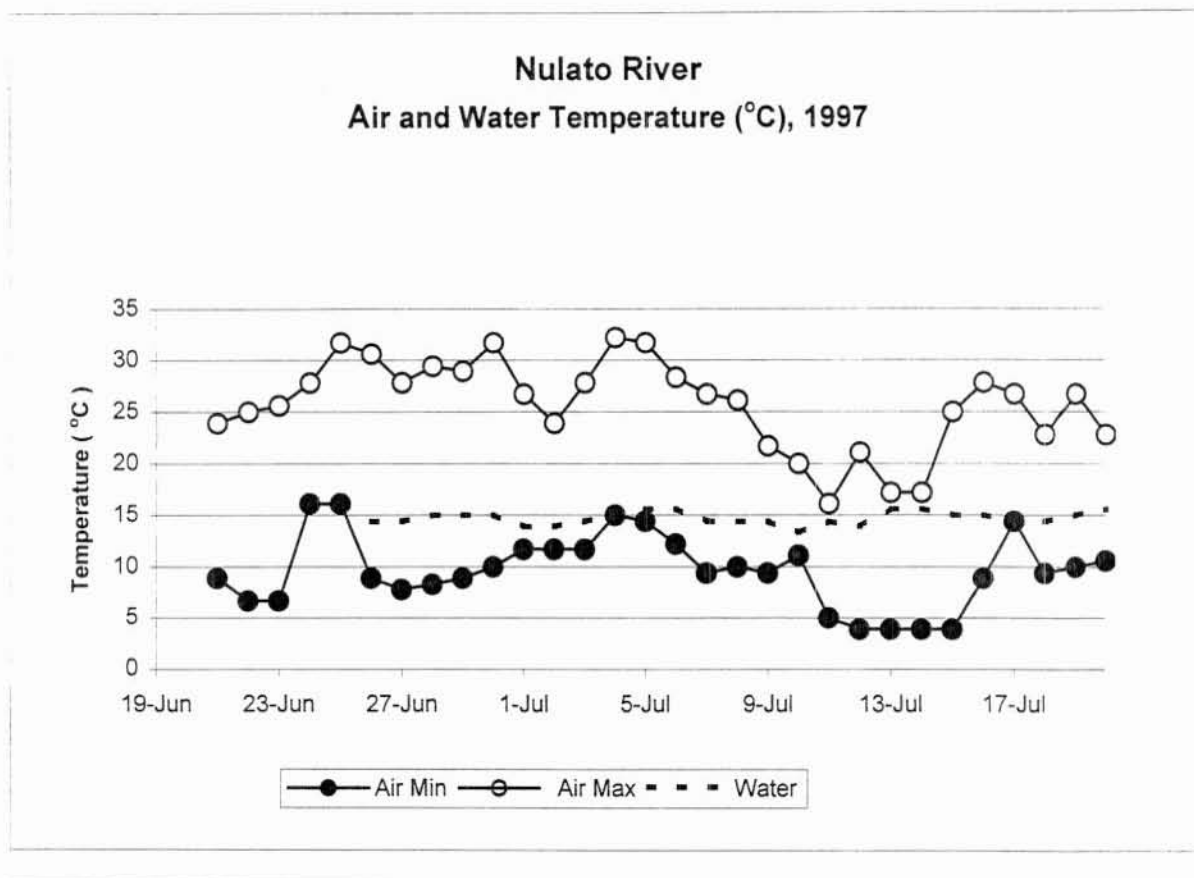


Figure 7. Nulato River tower project climatological and hydrological observations, 1997.

## APPENDIX TABLES



Appendix Table A.1. South Bank Nulato River expanded chinook salmon tower counts by hour and date, 1997. <sup>a</sup>

Date	Hourly Counts (hour ending)																								Total
	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00	Total
20-Jun																			0	0	0	0	0	0	0
21-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	8	0	0	16
24-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4	0	0	0	8
26-Jun	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	8	4	0	0	0	0	0	0	0	16
27-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	12	0	0	0	0	8	4	32
28-Jun	4	0	0	0	0	0	0	0	0	0	0	0	4	4	12	8	8	16	0	0	0	0	0	4	60
29-Jun	0	0	0	0	4	4	0	0	8	0	4	0	12	8	4	8	4	4	0	0	0	4	0	0	64
30-Jun	8	0	0	0	8	0	8	0	0	0	0	0	0	4	16	4	4	4	8	12	8	8	8	0	100
01-Jul	0	0	0	0	4	4	0	4	8	8	0	8	0	4	0	8	0	8	0	0	0	4	0	4	64
02-Jul	4	0	8	0	0	0	4	0	8	4	0	4	8	0	8	4	8	16	8	12	28	0	4	4	132
03-Jul	4	4	0	0	0	4	0	0	0	0	4	0	0	20	8	4	16	20	4	4	16	20	4	0	132
04-Jul	8	4	4	0	8	0	0	20	0	4	8	4	20	12	16	8	28	20	0	4	16	8	4	0	196
05-Jul	0	0	0	0	4	0	0	8	0	0	4	8	4	4	20	12	8	0	28	36	8	44	16	20	224
06-Jul	4	0	0	0	4	4	0	0	12	4	8	4	16	20	8	12	12	16	20	16	28	0	0	0	188
07-Jul	0	0	0	0	4	0	0	4	8	12	16	0	4	0	16	12	20	32	8	12	16	0	4	0	168
08-Jul	8	0	4	0	4	4	8	8	12	0	0	4	4	12	24	24	20	16	12	20	24	0	8	0	216
09-Jul	0	0	0	0	0	4	0	12	8	0	4	4	0	4	0	12	12	8	8	12	4	8	0	0	100
10-Jul	0	0	0	0	4	0	0	0	0	8	0	0	8	20	16	52	28	44	16	28	8	8	0	0	240
11-Jul	0	4	0	0	0	4	8	4	0	0	0	12	4	4	4	8	4	0	0	4	0	0	0	0	68
12-Jul	0	0	0	0	0	0	0	4	0	0	0	8	4	8	0	16	4	8	4	4	0	0	4	2	66
13-Jul	2	0	0	0	0	0	8	0	0	8	0	0	4	4	0	12	12	24	20	44	16	16	8	4	182
14-Jul	4	0	0	0	0	0	0	0	0	4	0	0	0	8	0	0	4	4	0	0	4	0	0	0	28
15-Jul	0	0	4	0	4	4	0	0	4	4	4	4	12	4	4	20	16	20	16	8	12	0	8	16	164
16-Jul	4	0	0	0	4	0	0	0	4	8	0	0	4	12	12	4	8	16	20	32	8	4	8	4	152
17-Jul	4	8	12	0	8	0	0	0	0	4	4	0	0	0	8	12	12	0	0	4	0	0	4	0	80
18-Jul	0	0	0	0	0	0	4	0	0	0	0	0	0	4	0	4	8	0	8	4	0	0	0	0	32
19-Jul	0	0	0	0	4	0	0	0	0	4	0	4	0	8	4	8	8	4	0	4	0	0	0	0	48
20-Jul	0	0	4	0	0	0	8	0	0	8	4	0	0	8	4	4	4	0	8	0	4	8	0	0	64
21-Jul	0	0	4	0	4	4	0	0	0	0	0	0	0	8	0	4									24
Total	54	20	40	0	68	36	48	68	76	80	60	52	120	184	184	264	264	300	188	256	212	140	88	62	2,864

<sup>a</sup> Numbers in italics represent interpolated estimates for missed counting periods due to poor counting conditions.

Appendix Table A.2. North Bank Nulato River expanded chinook salmon tower counts by hour and date, 1997.<sup>a</sup>

Date	Hourly Counts (hour ending)																								Total
	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00	
20-Jun																									0
21-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4
24-Jun	0	0	8	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	0	0	0	16
25-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	0	8
26-Jun	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	4	0	4	0	0	16
27-Jun	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	8	0	4	0	4	0	0	20
28-Jun	0	0	0	0	4	0	0	0	0	4	0	0	4	0	0	0	8	0	4	0	0	0	0	0	24
29-Jun	0	0	0	0	0	8	12	4	0	8	0	0	12	4	4	20	0	0	0	0	0	0	0	0	72
30-Jun	0	0	0	0	0	0	12	0	0	4	8	0	4	4	0	4	4	0	0	0	0	0	0	0	44
01-Jul	4	0	0	0	0	4	8	12	0	8	4	4	16	0	4	0	4	0	4	4	0	4	0	0	80
02-Jul	0	4	0	0	0	4	0	4	8	0	0	0	8	4	0	4	0	0	0	0	0	4	0	0	40
03-Jul	4	0	0	4	0	0	4	4	0	0	0	0	0	4	0	4	0	4	0	4	4	0	8	4	52
04-Jul	4	4	4	0	4	0	4	4	4	16	24	8	8	4	4	12	20	16	4	0	4	0	0	0	148
05-Jul	0	0	0	0	0	4	0	8	24	0	0	16	4	8	4	4	4	4	0	0	0	0	20	4	12
06-Jul	4	0	0	0	0	0	4	4	4	28	4	8	20	0	16	12	16	4	4	0	4	0	4	8	164
07-Jul	4	4	0	0	8	4	4	8	4	12	0	0	0	4	12	12	12	8	16	4	8	4	12	0	140
08-Jul	0	4	0	0	0	0	0	8	4	12	20	8	8	4	24	36	8	0	0	4	4	8	0	0	152
09-Jul	0	0	0	0	8	0	0	4	4	0	4	0	4	0	0	0	8	28	12	16	12	8	4	0	112
10-Jul	0	0	0	0	0	0	0	4	4	0	0	4	0	16	4	8	24	16	4	4	0	16	4	0	104
11-Jul	4	0	0	0	4	8	4	0	0	0	4	4	4	4	8	8	4	4	0	0	0	0	0	4	60
12-Jul	4	0	0	0	0	0	8	0	4	0	4	4	4	0	20	4	0	8	20	4	0	4	0	0	86
13-Jul	2	0	0	0	0	2	4	16	0	0	0	4	0	4	4	0	16	8	24	20	4	4	0	0	108
14-Jul	0	0	0	0	0	4	4	0	4	4	0	8	4	0	0	4	8	20	0	8	8	4	0	0	80
15-Jul	4	8	0	0	0	0	4	0	0	4	4	0	12	12	0	4	8	16	4	0	0	4	4	0	88
16-Jul	0	0	0	0	0	4	0	0	0	4	0	0	0	8	0	0	0	4	0	4	0	4	0	8	32
17-Jul	0	0	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	4	0	0	4	0	4	0	28
18-Jul	0	0	4	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	0	8	0	0	0	0	20
19-Jul	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	4	0	4	20
20-Jul	0	0	0	0	0	0	0	4	0	4	4	0	0	4	8	0	8	0	0	8	8	0	0	4	52
21-Jul	4	0	0	4	0	0	0	4	0	0	0	0	0	4	4	0	4								20
Total	38	24	20	16	24	42	76	88	88	88	84	84	116	128	96	144	160	124	100	92	64	108	60	38	1,902

<sup>a</sup> Numbers in italics represent interpolated estimates for missed counting periods due to poor counting conditions.



Appendix Table A.3. North and South Bank Nulato River combined expanded chinook salmon tower counts by hour and date, 1997. \*

Date	Hourly Counts (hour ending)																								Total
	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00	
20-Jun																			0	0	0	0	0	0	0
21-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	8	4	0	20
24-Jun	0	0	8	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	0	0	0	16
25-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	4	4	0	0	16
26-Jun	0	0	0	0	0	0	0	4	0	4	0	0	4	0	0	8	4	0	0	4	0	4	0	0	32
27-Jun	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	16	12	4	0	0	4	8	4	52
28-Jun	4	0	0	0	4	0	0	0	0	4	0	0	8	4	12	16	8	16	4	0	0	0	0	4	84
29-Jun	0	0	0	0	4	12	12	4	8	8	4	0	24	12	8	28	4	4	0	0	0	4	0	0	136
30-Jun	8	0	0	0	8	0	20	0	0	4	8	0	4	8	16	8	8	4	8	12	8	8	8	4	144
01-Jul	4	0	0	0	4	8	8	16	8	16	4	12	16	4	4	8	4	8	4	4	0	8	0	4	144
02-Jul	4	4	8	0	0	4	4	4	16	4	0	4	16	4	8	8	8	16	8	12	28	4	4	4	172
03-Jul	8	4	0	4	0	4	4	4	0	0	4	0	0	24	8	8	16	20	8	8	16	28	12	4	184
04-Jul	12	8	8	0	12	0	4	24	4	20	32	12	28	16	20	20	48	36	4	4	20	8	4	0	344
05-Jul	0	0	0	0	4	4	0	16	24	0	4	24	8	12	24	16	12	0	28	36	8	64	20	32	336
06-Jul	8	0	0	0	4	4	4	4	40	8	16	24	36	36	20	28	16	20	20	20	28	4	8	4	352
07-Jul	4	4	0	0	12	4	4	12	12	24	16	0	4	4	28	24	32	40	24	16	24	4	16	0	308
08-Jul	8	4	4	0	4	4	8	16	16	12	20	12	12	16	48	60	28	16	12	24	28	8	8	0	368
09-Jul	0	0	0	8	0	4	0	16	12	0	8	4	4	4	0	12	20	36	20	28	16	16	4	0	212
10-Jul	0	0	0	0	4	0	0	0	4	8	0	4	8	36	20	60	52	60	20	32	8	24	4	0	344
11-Jul	4	4	0	0	4	12	12	8	4	0	4	4	16	12	12	8	12	4	0	0	4	0	0	4	128
12-Jul	4	0	0	0	0	0	8	4	4	0	4	12	4	28	4	16	12	8	24	8	0	4	4	4	152
13-Jul	4	0	0	0	0	2	12	16	0	8	0	4	4	8	0	12	28	32	44	64	20	20	8	4	290
14-Jul	4	0	0	0	0	4	4	0	4	8	0	8	4	8	0	4	12	24	0	8	12	4	0	0	108
15-Jul	4	8	4	0	4	4	4	0	4	8	8	4	24	16	4	24	24	36	20	8	12	4	12	16	252
16-Jul	4	0	0	0	4	4	0	0	4	12	0	0	4	20	12	4	8	20	20	32	12	4	16	4	184
17-Jul	4	8	16	0	8	0	4	0	0	4	4	0	4	0	8	12	16	4	0	4	4	0	8	0	108
18-Jul	0	0	4	0	0	0	4	0	0	0	0	0	4	4	0	4	12	0	8	12	0	0	0	0	52
19-Jul	0	0	0	0	8	0	0	0	0	4	0	4	0	8	8	8	8	4	0	4	4	4	0	4	68
20-Jul	0	0	4	0	0	0	8	4	0	12	8	0	0	12	12	4	12	0	8	8	12	8	0	4	116
21-Jul	4	0	4	4	4	4	0	4	0	0	0	0	0	12	0	8									44
Total	92	44	60	16	92	78	124	156	164	168	144	136	236	312	280	408	424	424	288	348	276	248	148	100	4,766

\* Numbers in italics represent interpolated estimates for missed counting periods due to poor counting conditions.

Appendix Table A.4. South Bank Nulato River expanded summer chum salmon tower counts by hour and date, 1997.<sup>a</sup>

Date	Hourly Counts (hour ending)																								Total
	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00	Total
20-Jun																			20	0	16	4	4	0	44
21-Jun	8	4	28	4	4	0	0	0	4	0	4	0	4	0	8	0	0	0	4	4	0	0	4	0	80
22-Jun	24	12	8	20	16	28	4	0	0	0	0	0	0	0	4	12	16	8	36	4	4	44	20	4	264
23-Jun	68	92	76	28	40	24	4	0	4	0	0	4	0	8	44	36	52	144	120	164	124	140	200	108	1,480
24-Jun	92	40	28	36	20	12	20	44	4	4	4	0	36	32	124	312	356	296	288	276	120	148	192	176	2,660
25-Jun	284	360	164	76	84	40	36	28	24	8	4	16	24	36	152	104	180	232	152	116	108	300	244	376	3,148
26-Jun	184	104	48	104	40	40	20	16	44	36	20	24	16	68	156	176	588	448	132	156	80	104	68	84	2,756
27-Jun	52	72	28	100	48	24	28	16	32	16	28	24	20	76	128	200	316	192	136	140	96	76	144	140	2,132
28-Jun	120	112	116	84	72	68	32	24	32	24	44	96	48	88	32	96	140	216	100	232	140	268	488	332	3,004
29-Jun	124	112	128	140	68	60	64	36	60	64	148	104	216	140	192	236	268	252	232	280	172	212	248	424	3,980
30-Jun	332	280	244	152	84	72	80	60	96	76	124	72	68	228	276	180	252	192	236	324	380	324	272	180	4,584
01-Jul	204	112	64	72	92	164	140	168	208	152	200	136	72	228	272	156	248	220	292	296	304	388	320	308	4,816
02-Jul	384	128	192	148	212	180	168	188	84	188	224	140	320	252	292	232	388	568	432	312	480	340	276	260	6,388
03-Jul	80	72	112	132	116	164	116	96	120	324	136	216	260	476	364	464	480	708	716	428	412	360	244	160	6,756
04-Jul	380	244	112	204	212	244	160	144	164	180	248	368	376	728	316	1,120	888	960	464	400	300	208	128	148	8,676
05-Jul	236	112	216	244	232	148	160	200	148	136	156	224	204	336	812	972	612	652	716	712	288	240	304	280	8,340
06-Jul	292	208	248	220	184	180	140	164	212	240	172	192	304	524	480	468	500	612	456	372	276	284	204	192	7,124
07-Jul	124	92	116	128	132	140	100	148	152	132	236	220	248	192	408	524	1,204	1,088	368	316	308	252	128	108	6,864
08-Jul	260	136	168	116	152	124	172	168	128	224	284	292	204	976	312	584	496	392	312	448	340	168	188	140	6,784
09-Jul	48	84	68	136	192	84	88	104	128	76	44	56	112	60	40	192	324	316	204	336	172	288	156	168	3,476
10-Jul	48	76	156	128	140	108	64	84	56	68	104	48	284	232	304	464	500	668	612	444	298	224	184	148	5,412
11-Jul	96	76	68	84	128	112	72	72	72	112	116	60	96	136	172	144	132	136	124	132	60	76	64	56	2,396
12-Jul	52	44	28	36	76	44	64	60	40	44	76	140	132	212	136	368	276	168	92	148	144	56	51	68	2,555
13-Jul	89	65	61	60	60	53	84	60	20	28	24	48	64	72	80	92	268	244	328	200	132	56	36	76	2,300
14-Jul	56	8	0	20	32	12	8	36	20	12	12	92	64	20	28	32	100	192	204	220	100	124	76	48	1,516
15-Jul	64	24	40	32	56	64	72	40	44	40	60	64	28	52	48	96	164	192	84	196	172	76	68	156	1,932
16-Jul	76	48	36	44	44	48	56	40	64	32	48	52	40	84	76	148	140	160	204	180	160	120	92	96	2,088
17-Jul	80	68	60	44	48	44	72	80	68	44	52	40	76	92	100	120	160	68	40	52	64	56	52	32	1,612
18-Jul	32	20	20	20	16	28	12	12	20	16	28	20	24	36	28	24	12	36	20	40	20	12	16	20	532
19-Jul	16	8	8	16	20	12	16	24	16	28	20	12	16	36	60	84	36	36	60	40	32	28	20	16	660
20-Jul	4	16	8	4	12	8	12	24	12	12	20	24	16	20	8	16	8	12	24	36	16	64	16	12	404
21-Jul	8	16	8	8	4	8	8	8	0	0	0	4	0	8	4	12									96
Total	3,917	2,845	2,657	2,640	2,636	2,337	2,072	2,144	2,076	2,316	2,636	2,788	3,372	5,448	5,456	7,664	9,084	9,408	7,208	7,004	5,288	5,040 <sup>a</sup>	4,507	4,316	104,859

<sup>a</sup> Numbers in italics represent interpolated estimates for missed counting periods due to poor counting conditions.

Appendix Table A.5. North Bank Nulato River expanded summer chum salmon tower counts by hour and date, 1997. <sup>a</sup>

Date	Hourly Counts (hour ending)																								Total
	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00	
20-Jun																			0	0	8	4	4	4	20
21-Jun	4	0	4	8	0	0	4	0	0	0	0	0	0	0	0	0	0	0	20	0	4	20	16	8	88
22-Jun	16	12	4	0	8	12	16	0	0	0	0	0	0	0	8	0	48	20	4	24	32	12	40	4	260
23-Jun	12	8	8	16	24	28	8	8	8	4	4	12	0	8	24	36	112	136	16	72	12	120	140	48	864
24-Jun	16	32	84	8	4	0	0	24	4	16	8	20	32	24	148	56	76	144	64	56	136	88	56	60	1,156
25-Jun	72	60	76	72	32	40	36	44	48	12	0	52	36	84	72	124	120	72	136	156	96	84	100	84	1,708
26-Jun	92	96	96	56	52	20	24	20	24	32	12	16	20	40	96	60	384	360	76	100	68	32	12	48	1,836
27-Jun	40	68	28	16	20	24	24	28	24	16	28	20	16	72	76	112	276	232	96	84	92	184	76	84	1,736
28-Jun	92	84	48	72	28	20	16	44	32	72	52	64	56	28	60	92	108	116	144	104	100	76	148	156	1,812
29-Jun	52	56	44	64	52	36	64	44	36	28	72	124	124	168	176	224	180	232	132	148	200	276	244	216	2,992
30-Jun	312	116	112	92	64	104	28	32	44	60	96	64	104	124	168	184	128	204	176	192	276	208	280	164	3,332
01-Jul	120	100	52	112	48	124	112	76	88	100	72	56	112	168	196	204	232	172	96	88	136	124	136	116	2,840
02-Jul	132	84	72	60	92	76	72	88	164	144	128	96	84	156	140	168	136	92	56	112	84	136	68	72	2,512
03-Jul	84	36	48	68	64	40	76	92	84	44	60	40	68	96	80	96	96	212	96	64	68	88	72	68	1,840
04-Jul	136	152	112	52	56	76	68	80	48	64	148	104	144	188	192	180	348	792	296	148	124	72	92	84	3,756
05-Jul	148	52	60	52	108	96	112	88	68	76	80	48	116	128	496	288	324	148	152	116	92	108	64	72	3,092
06-Jul	104	124	180	140	144	188	112	128	132	124	136	116	84	140	124	148	204	300	156	248	252	132	96	112	3,624
07-Jul	52	68	56	48	84	76	68	40	56	88	60	56	92	68	172	232	892	752	332	348	292	276	180	116	4,504
08-Jul	72	48	96	60	84	56	48	96	76	116	152	132	164	188	420	424	296	224	40	92	100	72	56	48	3,160
09-Jul	16	0	0	12	20	36	20	44	88	32	20	20	16	40	36	60	96	148	140	80	88	60	52	64	1,188
10-Jul	56	28	20	60	56	68	28	32	40	24	56	44	40	28	24	64	380	92	384	224	68	60	52	48	1,976
11-Jul	40	52	64	44	48	140	52	60	36	48	44	60	44	68	64	56	100	96	40	44	32	40	48	40	1,360
12-Jul	36	32	24	24	40	32	44	36	28	24	16	48	36	40	52	156	228	192	196	80	92	48	48	46	1,598
13-Jul	26	18	12	12	28	18	20	20	24	32	28	40	48	44	56	40	112	72	212	100	116	80	48	52	1,258
14-Jul	16	4	0	0	16	4	8	12	20	16	8	8	24	28	36	40	72	108	60	60	44	68	56	32	740
15-Jul	16	44	16	28	12	20	32	40	36	28	56	36	24	36	76	116	108	76	48	40	68	36	36	56	1,084
16-Jul	24	20	12	40	56	36	36	32	40	24	32	16	24	36	16	20	28	44	40	68	80	72	76	56	928
17-Jul	40	52	32	32	16	24	28	24	20	32	20	24	36	52	36	48	72	48	8	24	32	16	36	28	780
18-Jul	20	12	4	16	12	20	28	12	12	8	4	16	12	20	16	12	32	16	24	32	24	16	20	4	392
19-Jul	8	4	0	8	4	4	8	4	12	4	0	16	12	32	44	56	44	52	28	24	28	12	8	8	420
20-Jul	12	4	4	20	0	12	28	24	8	12	8	16	12	20	16	8	28	24	20	28	12	16	8	16	356
21-Jul	4	8	0	4	0	8	12	8	8	12	4	0	4	12	4	12									100
Total	1,870	1,474	1,368	1,296	1,272	1,438	1,232	1,280	1,308	1,292	1,404	1,364	1,584	2,136	3,124	3,316	5,260	5,176	3,288	2,956	2,856	2,636	2,368	2,014	53,312

<sup>a</sup> Numbers in italics represent interpolated estimates for missed counting periods due to poor counting conditions.

Appendix Table A.6. North and South Bank Nuliat River combined expanded summer chum salmon tower counts by hour and date, 1997.<sup>a</sup>

Date	Hourly Counts (hour ending)																								Total
	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00	
20-Jun	12	4	32	12	4	0	4	0	4	0	4	0	4	0	8	0	0	0	20	0	24	4	20	8	64
21-Jun	40	24	12	20	24	40	20	0	0	0	0	0	0	0	12	12	64	28	40	28	36	56	60	8	168
22-Jun	80	100	84	44	64	52	12	8	12	4	4	16	0	16	68	72	164	280	136	236	136	260	340	156	524
23-Jun	108	72	112	44	24	12	20	68	8	20	12	20	68	56	272	368	432	440	352	332	256	236	248	236	2,344
24-Jun	356	420	240	148	116	80	72	72	72	20	4	68	60	120	224	228	300	304	288	272	204	384	344	460	3,816
25-Jun	276	200	144	160	92	60	44	36	68	68	32	40	36	108	252	236	972	808	208	256	148	136	80	132	4,856
26-Jun	92	140	56	116	68	48	52	44	56	32	56	44	36	148	204	312	592	424	232	224	188	260	220	224	4,592
27-Jun	212	196	164	156	100	88	48	68	64	96	96	160	104	116	92	188	248	332	244	336	240	344	636	488	3,868
28-Jun	176	168	172	204	120	96	128	80	96	92	220	228	340	308	368	460	448	484	364	428	372	488	492	640	4,816
29-Jun	644	396	356	244	148	176	108	92	140	136	220	136	172	352	444	364	380	396	412	516	656	532	552	344	6,972
30-Jun	324	212	116	184	140	288	252	244	296	252	272	192	184	396	468	360	480	392	388	384	440	512	456	424	7,916
01-Jul	516	212	264	208	304	256	240	276	248	332	352	236	404	408	432	400	524	660	488	424	564	476	344	332	7,656
02-Jul	164	108	160	200	180	204	192	188	204	368	196	256	328	572	444	560	576	920	812	492	480	448	316	228	8,900
03-Jul	516	396	224	256	268	320	228	224	212	244	396	472	520	916	508	1,300	1,216	1,752	760	548	424	280	220	232	8,596
04-Jul	384	164	276	296	340	244	272	288	216	212	236	272	320	464	1,308	1,260	936	800	868	828	380	348	368	352	12,432
05-Jul	396	332	428	360	328	368	252	292	344	364	308	308	388	664	604	616	704	912	612	620	528	416	300	304	11,432
06-Jul	176	160	172	176	216	216	168	188	208	220	296	276	340	260	580	756	2,096	1,840	700	664	600	528	308	224	10,748
07-Jul	332	184	264	176	236	180	220	264	204	340	436	424	368	1,164	732	1,008	792	616	352	540	440	240	244	188	11,368
08-Jul	64	84	68	148	212	120	108	148	216	108	64	76	128	100	76	252	420	464	344	416	260	348	208	232	9,944
09-Jul	104	104	176	188	196	176	92	116	96	92	160	92	324	260	328	528	880	760	996	668	336	284	236	196	4,664
10-Jul	136	128	132	128	176	252	124	132	108	160	160	120	140	204	236	200	232	232	164	176	92	116	112	96	7,388
11-Jul	88	76	52	60	116	76	108	96	68	68	92	188	168	252	188	524	504	360	288	228	236	104	99	114	3,756
12-Jul	115	83	73	72	88	71	104	80	44	60	52	88	112	116	136	132	380	316	540	300	248	136	84	128	4,153
13-Jul	72	12	0	20	48	16	16	48	40	28	20	100	88	48	64	72	172	300	264	280	144	192	132	80	3,558
14-Jul	80	68	56	60	68	84	104	80	80	68	116	100	52	88	124	212	272	268	132	236	240	112	104	212	2,256
15-Jul	100	68	48	84	100	84	92	72	104	56	80	68	64	120	92	168	168	204	244	248	240	192	168	152	3,016
16-Jul	120	120	92	76	64	68	100	104	88	76	72	64	112	144	136	168	232	116	48	76	96	72	88	60	3,016
17-Jul	52	32	24	36	28	48	40	24	32	24	32	36	36	56	44	36	44	52	44	72	44	28	36	24	2,392
18-Jul	24	12	8	24	16	24	16	24	28	32	20	28	28	68	104	140	80	88	88	64	60	40	28	24	924
19-Jul	16	20	12	24	12	20	40	48	20	24	28	40	28	40	24	24	36	36	44	64	28	80	24	28	1,080
20-Jul	12	24	8	12	4	16	20	16	8	12	4	4	4	4	20	8	24	36	44	64	28	80	24	28	760
21-Jul	12	24	8	12	4	16	20	16	8	12	4	4	4	4	20	8	24	36	44	64	28	80	24	28	196
Total	5,787	4,319	4,025	3,936	3,908	3,775	3,304	3,424	3,384	3,608	4,040	4,152	4,956	7,584	8,580	10,980	14,344	14,584	10,496	9,960	8,144	7,676	6,875	6,330	158,171

<sup>a</sup> Numbers in italics represent interpolated estimates for missed counting periods due to poor counting conditions.

Appendix Table B.1. Nulato River summer chum salmon age and sex composition by stratum and weighted season total, 1997.

		Brood Year and Age Group			Total
		1993 0.3	1992 0.4	1991 0.5	
Stratum Dates: 6/25-7/02		Stratum 1			
Female	No. in Escapement	1,694	16,383	0	18,077
	Percent of Sample	3.0	29.0	0.0	32.0
Male	No. in Escapement	4,519	31,636	2,260	38,415
	Percent of Sample	8.0	56.0	4.0	68.0
Total	No. in Escapement	6,213	48,019	2,260	56,492
	Percent of Sample	11.0	85.0	4.0	100.0
Stratum Dates: 7/04-7/08		Stratum 2			
Female	No. in Escapement	10,672	28,622	970	40,264
	Percent of Sample	16.5	44.4	1.5	62.4
Male	No. in Escapement	6,792	16,494	970	24,256
	Percent of Sample	10.5	25.6	1.5	37.6
Total	No. in Escapement	17,464	45,116	1,940	64,520
	Percent of Sample	27.1	69.9	3.0	100.0
Stratum Dates: 7/09-7/12		Stratum 3			
Female	No. in Escapement	2,043	6,601	0	8,644
	Percent of Sample	10.2	33.1	0.0	43.3
Male	No. in Escapement	3,772	6,759	786	11,317
	Percent of Sample	18.9	33.9	3.9	56.7
Total	No. in Escapement	5,815	13,360	786	19,961
	Percent of Sample	29.1	66.9	3.9	100.0
Stratum Dates: 7/13-7/15		Stratum 4			
Female	No. in Escapement	1,946	2,394	299	4,639
	Percent of Sample	22.0	27.1	3.4	52.5
Male	No. in Escapement	1,497	2,320	374	4,191
	Percent of Sample	16.9	26.3	4.2	47.5
Total	No. in Escapement	3,443	4,714	673	8,830
	Percent of Sample	39.0	53.4	7.6	100.0
Stratum Dates: 7/19-7/20		Stratum 5			
Female	No. in Escapement	1,600	2,830	0	4,430
	Percent of Sample	19.1	33.8	0.0	52.9
Male	No. in Escapement	1,723	1,846	369	3,938
	Percent of Sample	20.6	22.1	4.4	47.1
Total	No. in Escapement	3,323	4,676	369	8,368
	Percent of Sample	39.7	55.9	4.4	100.0
Weighted Season Total					
Female	No. in Escapement	17,955	56,830	1,269	76,054
	Percent of Sample	11.4	35.9	0.8	48.1
Male	No. in Escapement	18,303	59,055	4,759	82,117
	Percent of Sample	11.6	37.3	3.0	51.9
Total	No. in Escapement	36,258	115,885	6,028	158,171
	Percent of Sample	22.9	73.3	3.8	100.0

**NAME** \_\_\_\_\_

[illegible][illegible]

[illegible]

32



Appendix Table C.3. Nulato River project hourly salmon counts.

Nulato River Tower Project Hourly Salmon Counts, Date\_\_\_\_, Year\_\_\_\_.

Right Bank (gravel-bar side)

Left Bank (cut-bank side)

Total Both Banks

Hour Ending			Chum		Chinook				Chum		Chinook		Chum	Chinook
	Minutes Counted	Expansion Factor *	Actual Counts	Expanded Counts	Actual Counts	Expanded Counts	Minutes Counted	Expansion Factor *	Actual Counts	Expanded Counts	Actual Counts	Expanded Counts	Expanded Counts	Expanded Counts
0100														
0200														
0300														
0400														
0500														
0600														
0700														
0800														
0900														
1000														
1100														
1200														
1300														
1400														
1500														
1600														
1700														
1800														
1900														
2000														
2100														
2200														
2300														
2400														
Total														
													100.0%	100.0%

\* Hourly expansion factor =  $60/(\text{number of minutes counted})$



**Nulato River Tower Project**  
**Radio Report: Adult Salmon Tower Counts**

[illegible]

Appendix Table C.5. Nulato River beach seine catch record form.

Year\_\_\_\_\_

### Nulato River Tower Project Beach Seine Catch Record

[illegible]

